

THE
Naturalist's Companion,
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THE
NATURALIST'S COMPANION,

Being a Brief Introduction to the different branches

OF

NATURAL HISTORY,

WITH

**APPROVED METHODS FOR COLLECTING AND
PRESERVING**

THE

Various Productions of Nature.



BY GEORGE GRAVES, F.L.S.



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Preface,

THE want of practical instructions for obtaining and preserving the various productions of Nature has long prevailed, and in endeavouring to supply this desideratum, the Author has been anxious to combine amusing and instructive information, with the results of practical experience, without encreasing the bulk of this volume beyond that of a *Pocket Book*, and at the same time form a compendious introduction to each branch of *Natural History*.

In performing this task, he has prefixed a general outline of the characters of each Class and Order, with the essential or generic characters of the different families; generally accompanied with a brief sketch of the habits, æconomy, places of resort, food, and probable modes of procuring the various species; for the generic characters he is principally indebted to Authors who have written on the respective branches of the Science, having in most cases only rendered the original in more familiar language, avoiding as much as possible all technical phrases; and where these are unavoidable, he trusts the accompanying *Plates* will render them intelligible; as well as more completely fix on the memory of the Student the peculiar forms of the genera delineated.

The Instructions for obtaining and preserving the various subjects, will, he presumes, be found easily reduced to practice, and particularly adapted for the use of those, whose business or pleasures may lead them to make excursions in our own, or to visit foreign countries; to promote the application of the leisure of such persons, to the useful and rational study of the Wonders of the Creation, and to enable them to preserve and transport the proceeds of their studies, with a probability of their arriving in good condition, are the principal designs of the following pages.

Fully impressed with a conviction, that however conversant any person may be with the various branches of this Science, yet, that a long life studiously devoted to any one branch, will not command perfection, but much will be left for future enquirers.

The Author will thankfully receive any communication on the subject of preserving any particular branch of the study, differing from those herein recommended, more especially from persons who have devoted their attention to any one science, as such are more likely to obtain perfection, than others, whose pursuits are more general.

In submitting this little Volume to the Scientific Reader, the Author solicits his indulgence, it having been written during the few hours of leisure, afforded by a laborious profession, which he hopes will be accepted as an apology for such errors as may have occurred.

Walworth, June, 1817.

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ERRATA.

Page 46, line 18, for name, read mane.	
95, — 19 —	PIDGEON, read PIGEON.
203, — 17 —	Bupertis, read Buprestis.
210, — 14 —	Cocous, read Coccus.
211, — 20 —	Phalenæ, read Phalænæ.
218, — 28 —	Formicula, read Fomica.
228, — 1 —	Lipedopterous, read Lepidopterous.
— 8 —	Lipedoptera, read Lepidoptera.
229, — 10 —	Lipedoptera, read Lepidoptera.
230, — 7 —	Lipedopterous, read Lepidopterous.
233, — 1 —	Ditto, read Ditto.





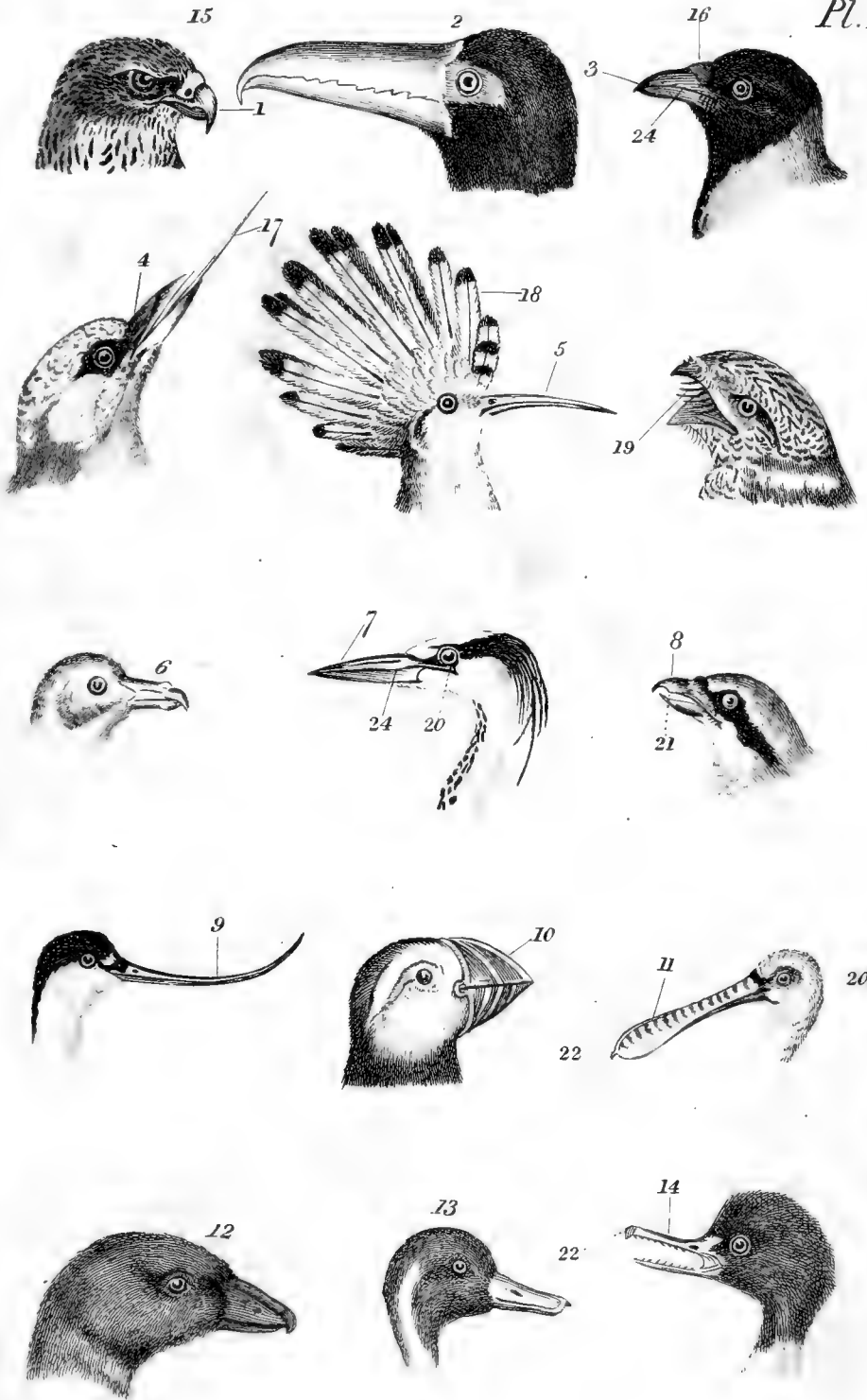


PLATE I.

Fig. 1.—A Hooked Bill, as in the genus *Falco*. *Cere*, a bare soft skin at the base of the Bill, fig. 15.

Fig. 2.—A Serrated or Notched Bill, as in the genus *Ramphastos*.

Fig. 3.—A Cultrated Bill, as in the genus *Corvus*. Reflected *Vibrissæ*, fig. 16.

Fig. 4.—A Cuneated or Wedge-shaped Bill, as in the genus *Picus*. A cylindrical extensile tongue, 17.

Fig. 5.—A Curvated Bill. An erected Crest, fig. 18.

Fig. 6.—*Nostrils* covered by or contained in a tube, as in the genus *Procellaria*.

Fig. 7.—A Strait, compressed, cultrated Bill. *Lore* a bare skin surrounded the eyes, fig. 20. Projecting edge of the upper mandible, by means of which, the Birds whose Bills are thus constructed, cut their food as with scissors, fig. 24.

Fig. 8.—A Hooked notched Bill, as in the genus *Lanius*; the notch, fig. 21.

Fig. 9.—A Recurved Bill, as in the genus *Recurvirostra*.

Fig. 10.—A Grooved Bill, as in the genus *Alca*.

Fig. 11.—A Spoon-shaped Bill, as in the genus *Platalea*. Nail at the tip of the Bill, fig. 22.

Fig. 12.—A *compressed* Bill, as in Geese.

Fig. 13.—A *depressed* Bill, as in Ducks.

Fig. 14.—A Serrated or Toothed Bill, as in the genus *Mergus*.

PLATE II.

Fig. 1.—A Foot formed for walking and perching, claws, retractile; as in the genus *Falco*.

Fig. 2.—A Foot formed for walking and perching, claws not retractile, as in the Gallinaceous tribe.

Fig. 3.—A climbing foot, as in the genera *Picus*, *Cuculus*, &c.

Fig. 4.—A walking foot, as in the genus *Corvus*.

Fig. 5.—Foot of the King-Fisher, shewing the situation and connection of the Toes.

Fig. 6.—A Spurred leg, as in the genus *Phasianus*.

Fig. 7.—A leg bare above the knee, as in all the Waders.

Fig. 8.—A Semi-palmated Foot, as in the genera *Ardea*, *Platalea*, &c.

Fig. 9.—A Pinnated Foot, with the edges of the toes scalloped, as in the genera *Fulica*, *Phalaropus*, &c.

Fig. 10.—A Lobated Foot, the toes margined with a membranous edgeing, as in the genus *Podiceps*.

Fig. 11.—A Three-toed Webbed Foot, as in the genus *Alca*, *Uria*.

Fig. 12.—A Palmated Foot, as in the genera *Anas*, *Recurvirostra*.

Fig. 13.—A Palmated Foot, with the four toes connected, as in the genus *Pellicanus*.





Fig. 14.—*Fringilla Carduelis*; the Goldfinch; *a*, bill; *b*, forehead; *c*, cheek; *d*, hind-head; *e*, breast; *f*, back; *g*, spurious wing; *h*, shoulder, and lesser wing coverts; *i*, secondary quill-feathers; *j, j*, greater quill-feathers; *k*, tertials; *l*, tail-coverts; *m*, tail; *n*, great-wing coverts; *o*, auricles; *p*, throat.

Fig. 15.—A Spur.

Fig. 16.—A Pectinated Foot, as in the genus *Tetrao*.

PLATE III.

A.—An Insect of the Coleopterous Order, with its wings, &c. distended on the setting board.

B.—An Insect of the Hemipterous Class.

C.—An Insect of the Lipedopterous Class, with its wings expanded.

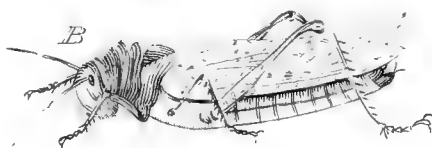
D. An Insect of the Order Neuroptera.

E.—An Insect of the Order Hymenoptera.

F.—A Dipterous Insect.

Of the Order Aptera we have declined giving any figure, as, but few of the genera possess any characters in common, except the absence of wings.

The various forms of Antennæ here figured, are described in the enumeration of the various genera.







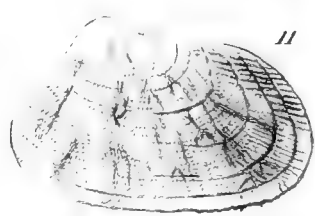
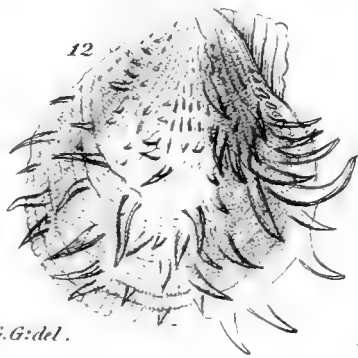
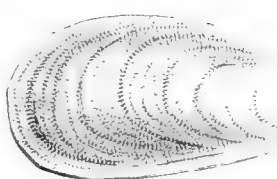
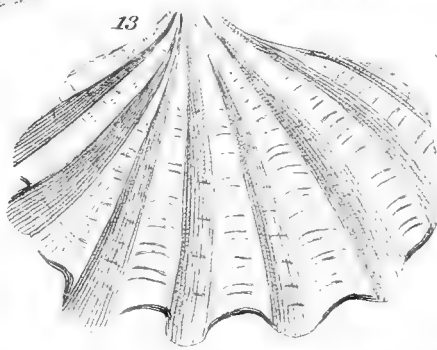
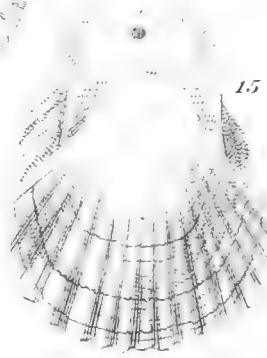
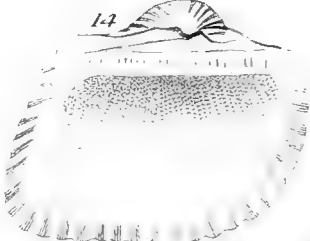
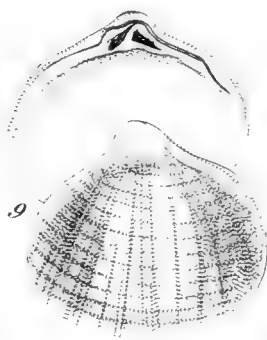
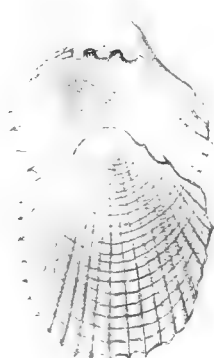
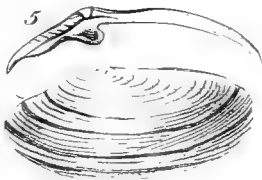
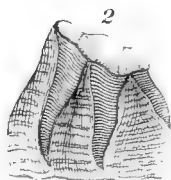
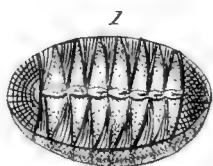


PLATE IV.

Fig. 1.—Chiton.

Fig. 2.—Lepas, division ** Balanus.

Fig. 3.—Lepas.

Fig. 4.—Pholas.

Fig. 5.—Mya.

Fig. 6.—Solen.

Fig. 7.—Tellina.

Fig. 8.—Cardium.

Fig. 9.—Mactra.

Fig. 10.—Donax.

Fig. 11.—Venus.

Fig. 12.—Spondylus.

Fig. 13.—Chama.

Fig. 14.—Arca.

Fig. 15.—Ostrea.

Fig. 16.—Anomia.

Fig. 17.—Mytilus.

PLATE V.

Fig. 1.—Pinna.

Fig. 18.—Argonauta.

Fig. 19.—Nautilus.

Fig. 20.—Conus.

Fig. 21.—Cypræa.

Fig. 22.—Bulla.

Fig. 23.—Voluta.

Fig. 24.—Buccinum.

Fig. 25.—Strombus.

Fig. 26.—Murex.

Fig. 27.—Trochus.

Fig. 28.—Turbo.

Fig. 29.—Helix.

Fig. 30.—Nerita.

Fig. 31.—Haliotis.

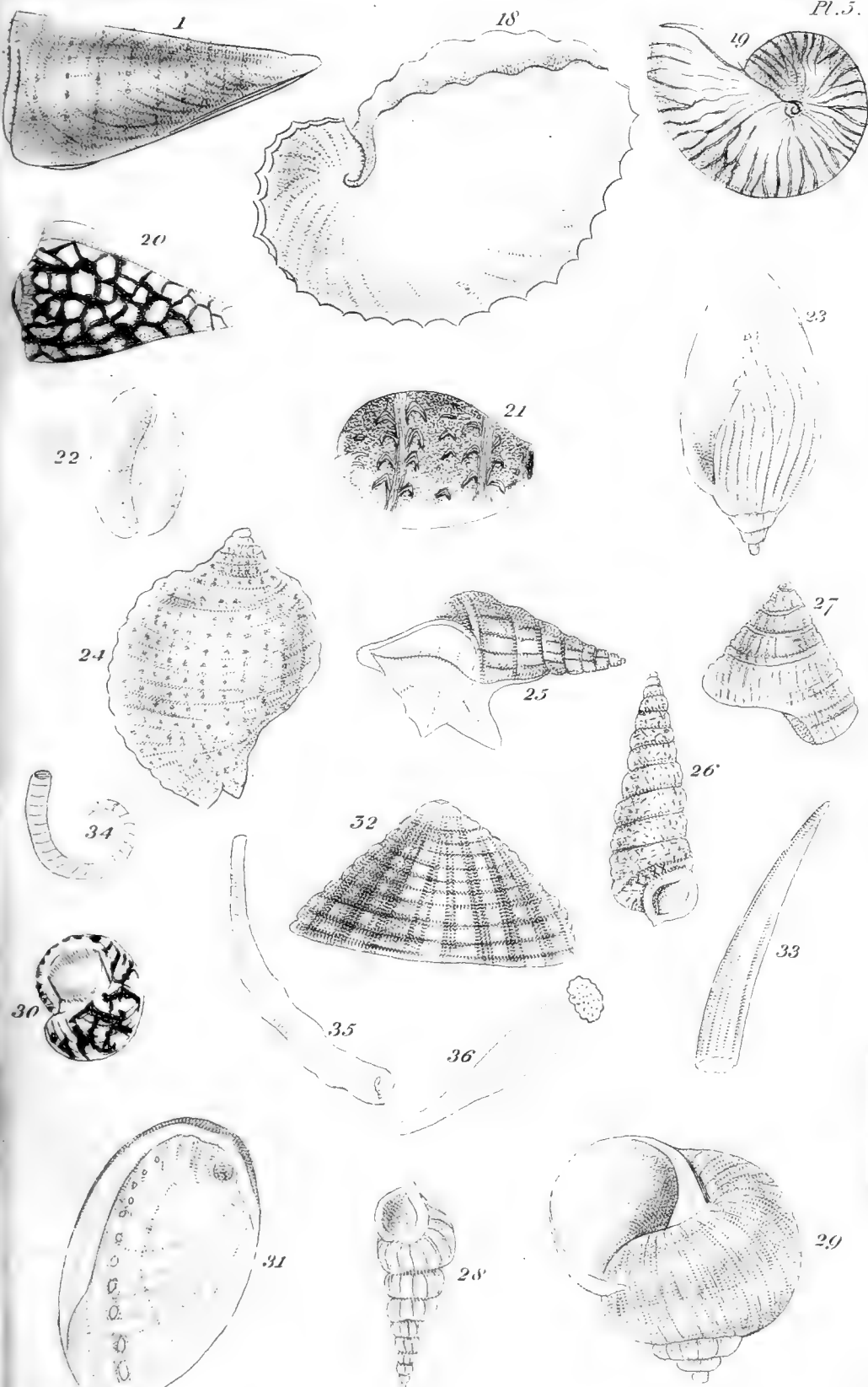
Fig. 32.—Patella.

Fig. 33.—Dentalium.

Fig. 34.—Serpula.

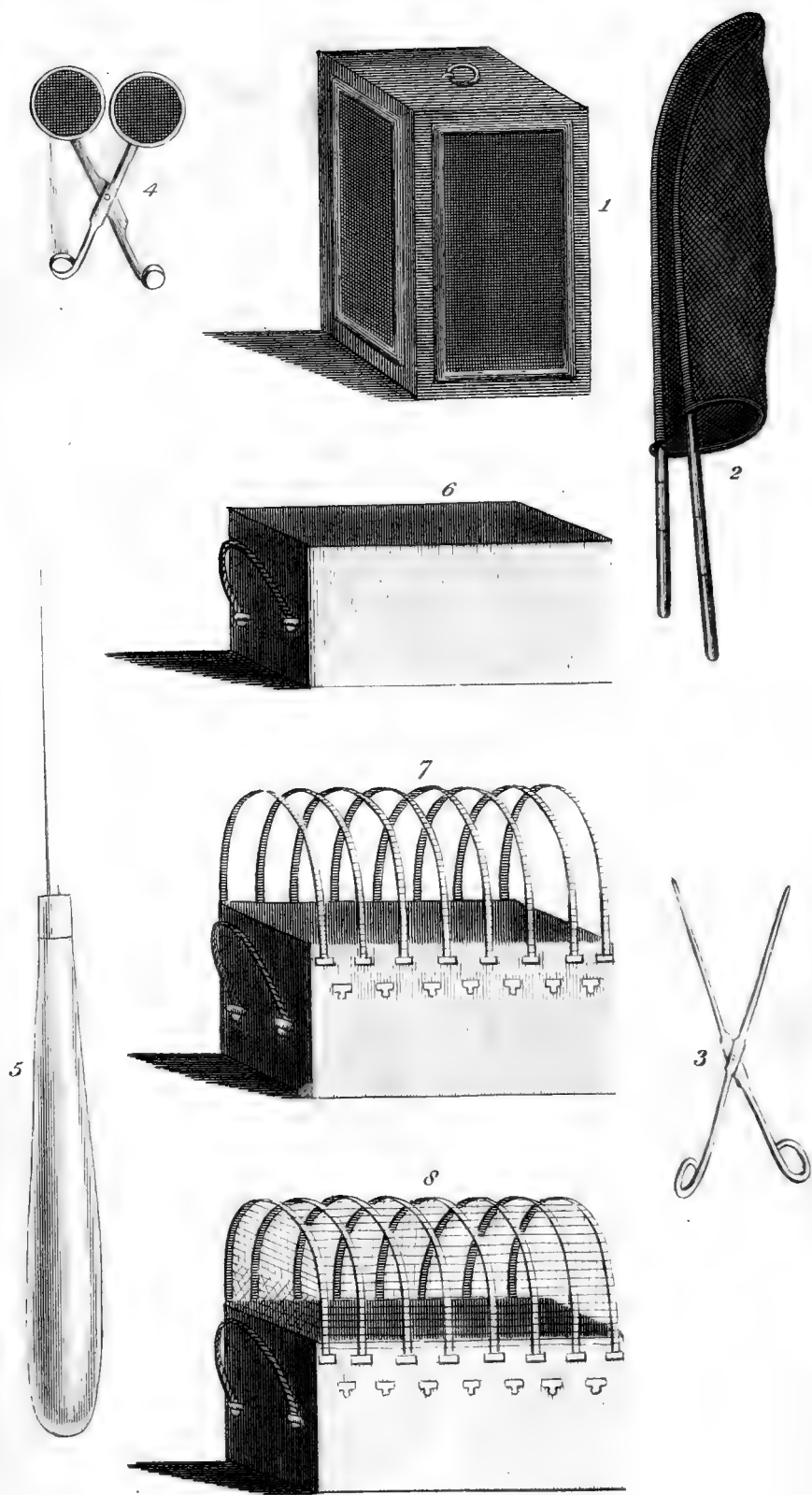
Fig. 35.—Teredo.

Fig. 36.—Sabella.





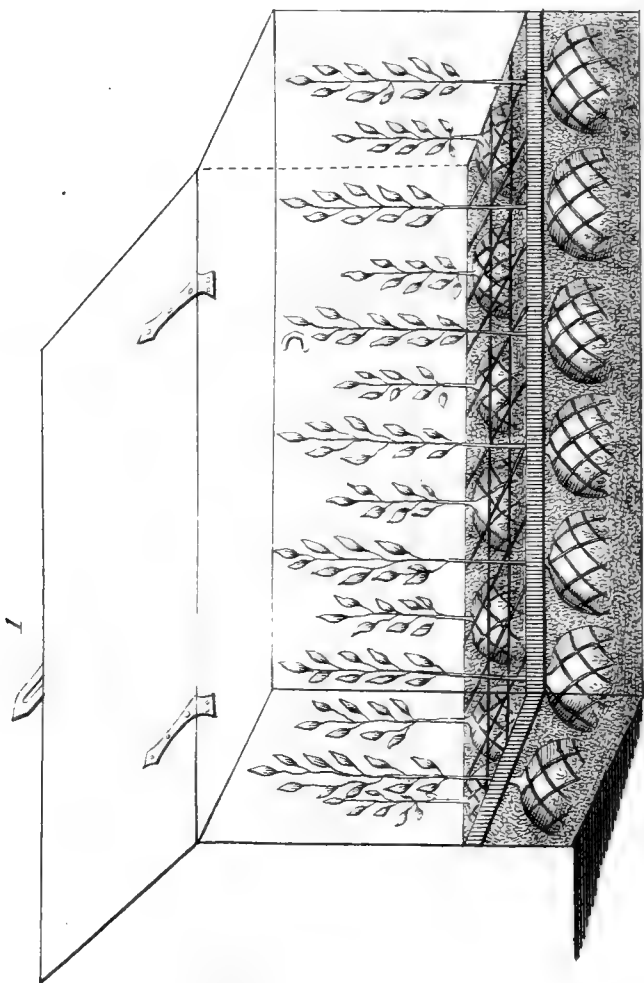








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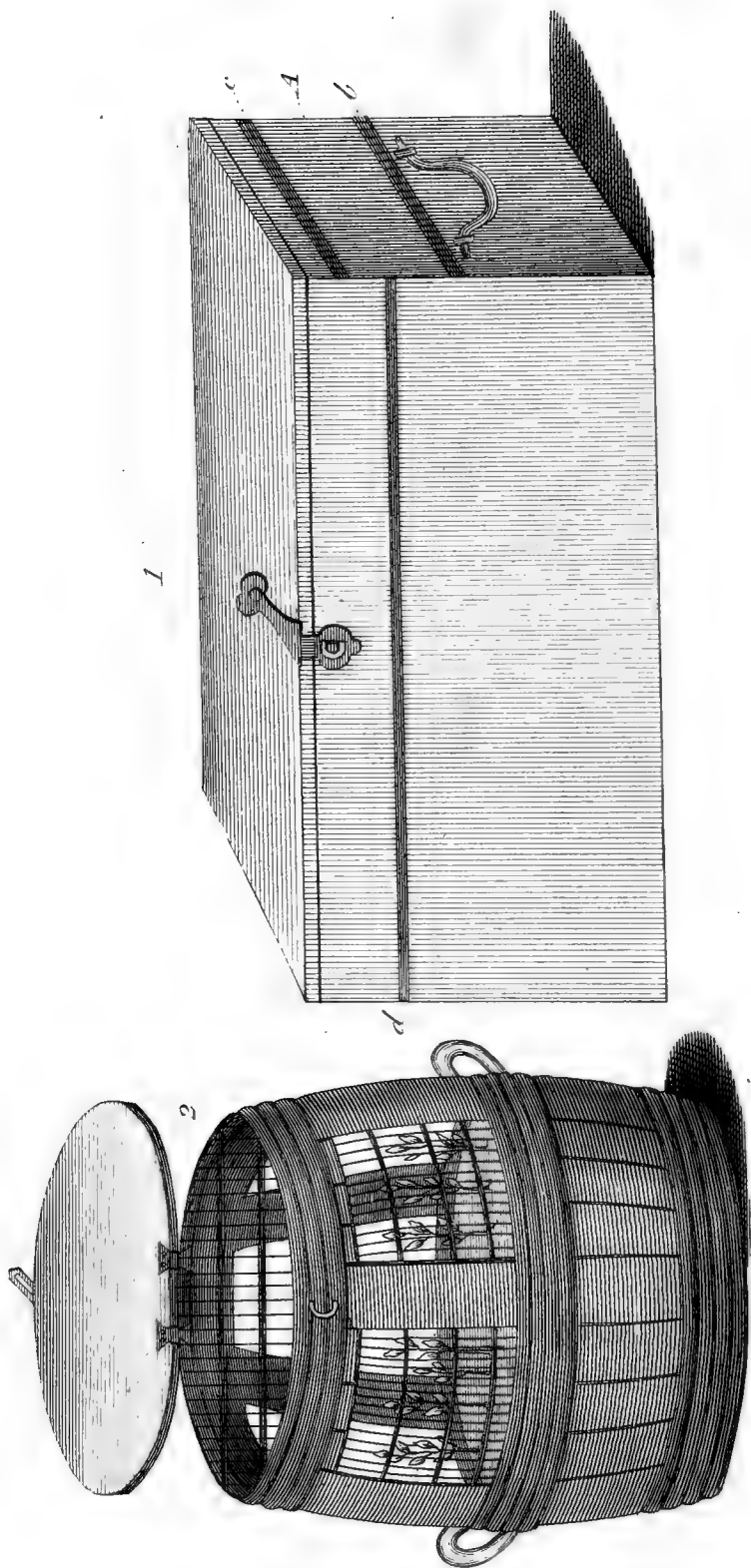


PLATE VI.

Fig. 1.—Breeding Box for rearing Caterpillars.

Fig. 2.—Insect Net.

Fig. 3.—Forceps for securing Insects armed with stings.

Fig. 4.—A Forcep Net.

Fig. 5.—A Setting Needle.

Fig. 6.—A Box for Seeds or Bulbs.

Fig. 7.—A Ditto Ditto Hooped.

Fig. 8.—A Ditto Ditto Ditto and Netted.

PLATE VII.

Fig. 1.—A Box, with Plants packed in Moss, in a fit state for transporting.

Fig. 2.—A Herborizing Box.

PLATE VIII.

Fig. 1.—A Box of Plants packed and shut down in inclement weather. A, a part made to slide out for the admission of Air; *a*, *b*, *c*, apertures for the admission of light and air in inclement weather.

Fig. 2.—A Cask prepared for transporting Plants.



Introduction.

How wond'rous is this scene! where all is form'd
With number, weight and measure! all design'd
For some great end! where not alone the plant
Of stately growth; the herb of glorious hue,
Or foodful substance; not the labouring steed,
The herd, and flock that feeds us; not the mine
That yields us stores for elegance and use;
The sea that loads our tables; and conveys
The wanderer man from clime to clime; with all
Those rolling spheres, that from on high shed down
Their kindly influence: not these alone,
Which strike ev'n eyes incurious; but each Moss
Each Shell, each crawling Insect, holds a rank
Important in the plan of HIM who framed
This scale of beings, hold a rank, which lost
Wou'd break the chain, and leave behind a gap
Which nature's self would rue.

STILLINGFLEET.

THE advantages arising from the study of Natural History, being so important, we cease to wonder that men possessed of great mental discernment, should have devoted their time and attention to endeavour by promoting the knowledge of its different branches, to add to the comforts and happiness of their fellow men. To insist on the benefits derived from only a partial or superficial acquaintance with the subjects, must be esteemed unnecessary, as our food, clothing, and every domestic convenience, are all derived from one or other branch of this science.

It will be sufficient for our present purpose, to give a brief outline of this extensive field, just sufficient indications by which the observing mind may be led to contemplate and investigate the particular subjects in detail; and whilst we slightly glance at the various objects composing this vast science, it will be, not only to shew the paths already trodden, but to point out, where fresh scenes are likely to open to the view of the practical Naturalist, and which will in all probability amply repay him for investigating.

A continued series of causes and effects will appear to the observer, in every branch and family of organized beings, such an existing connection between the different parts of this vast machine, that we may reasonably conclude, that Nature's works are each rendered subservient to the general good and prosperity of the whole.

Natural History has been divided into three grand or primary kingdoms, the ANIMAL, the VEGETABLE, and the MINERAL; these are again subdivided, the first into six *Classes*; MAMMALIA, or Animals that give suck; AVES, or Birds; AMPHIBIA, or Reptiles; PISCES, or Fishes; INSECTA, or Insects; VERMES, or Worms. Each of the classes is again separated into orders, and these orders into genera or particular families. The other kingdoms have been divided in a similar way, as will be seen under their respective heads.

To render this little volume generally useful, the author has prefixed to the several divisions the essential characters of each particular order, and likewise the generic characters of the different families, from Dr. Turton's

translation of the *Systema Naturæ* of Linneas, and from other writers, on the different branches of the science; by which the Naturalist will be enabled, on procuring any species of Animal, &c. to find its place in the System.

It may not be improperly urged in this place, that it is not by merely accumulating a large mass of different subjects, which may serve only to amuse the curious, or idle, that this delightful study is advanced; but it is by acquiring a knowledge of the habits, the propensities, and the connexions subsisting between the various subjects, that the science acquires interest; that there is a connected chain in this grand plan of creation, is evident to every reflecting mind, so much so, that the more we search into the depths of the science, the more difficulty we find in pointing out or determining where one class terminates, or another commences; and this is not confined only to the minute parts of the creation; but we find it strongly pointed out in the Mammiferous Class of Animals: thus for instance, the whole order *Cete*, is composed of Animals, which from the nature of the element in which they reside, and from their exterior conformation, have been most generally accounted as Fishes; but on a closer examination we find they possess, or are endued with all the properties of Quadrupeds, except the power of existing out of water; and that though Fishes in appearance, they possess nothing in common with that class, but the power of living in water. In other departments we find it difficult to say, whether many of the marine productions belong to the Animal, or Vegetable tribes. It is a well known fact, that we find some plants endued with the power

of voluntary motion, others again shrinking or collapsing on the slightest touch, and we find animals firmly attached to rocks and stones, not only wanting the locomotive power, but possessing an existence hardly superior to a vegetative life.

In the functions of the different branches of this study, we cannot but observe a great and striking similarity; and at the same time, must see, that effects of a similar nature are constantly being produced by causes as various as the subjects of the science. To trace the effects to their true causes, and by these means acquainting ourselves with the properties and functions of the different individuals, comprising the extensive families of Animals and Vegetables, we become acquainted with facts highly instructive and useful, and which give us clearer views and conceptions of the power, wisdom and beneficence of their ALMIGHTY CREATOR; as we find so much forethought, such a peculiar benevolence in the care bestowed, in maintaining and supporting this vast family, that we are led to exclaim

“ —————.ALMIGHTY BEING

Cause and support of all things, can we view

These objects of our wonder, can we feel

These fine sensations and not think of thee?”

The Zoology of Britain constantly affords opportunities of study, as in this department some of its products are ever at hand to consult or examine. The British QUADRUPEDS are not numerous, and only the Fox and the tribes of Weesels and Rats are in any way noxious or injurious to her inhabitants. The ORNITHOLOGY of this kingdom is extensive, probably considerably exceeding

three hundred species, but few of which are of any material inconvenience to man. Of *AMPHIBIÆ* our species are few, and only one venomous reptile is found in the British Islands. Our species of *FISHES* are numerous, many kinds of which are in immense abundance, and offer a healthful supply of food, frequently in boundless profusion; in fact so prodigious is the quantity consumed, for food, for the purpose of extracting oil, and for manure, as to baffle all attempts at calculation as to number.

INSECTS are not so numerous as in more southern countries, though we have a considerable variety, and some of extreme beauty and interest. Of the class *Vermes*, the *CONCHOLOGY* of Great Britain, though it offers numerous species, is but very poor in point of beauty, compared with many other countries; of those kinds that are used for the purpose of food, as Oysters, Muscles, Scallops, &c. we have abundance, on most of our shores; of the other divisions in this class we have a great variety, but as they are not subjects of general interest, we shall merely enumerate them in their generic order, pointing out any peculiarities in their form, structure and habits.

The Botanical subjects indigenous to Great Britain are numerous, and her forests have long contributed to sustain her naval superiority; her products of Grain, Pulse, Fruits and Vegetables, applied to the purpose of food by her inhabitants, and of Grass and Herbage for Cattle, are not surpassed in Countries situated under a more genial temperature. Here the Botanist has it always in his power to examine some or other species of plant, as every period of the

revolving year produces some kinds peculiar to the season : of *Phenogamous*, or Flower bearing plants, nearly eighteen hundred species have been enumerated; whilst of the *Cryptogamous* ones, as Ferns, Mosses, Lichens, Fuci, Fungi, &c. the number is nearly doubled : many of our native plants possess great beauty; some excite our admiration by their brilliancy or delicacy of colouring; others by their singularity of structure; many add to our comforts as medicines, or by affording dyes, &c. contribute to the support of the Manufacturer or Mechanic; and the whole call forth our wonder and demand our gratitude to their great Architect, for the blessings this portion of his works is continually dispensing to us.

The MINERALOGY of this country (which has lately become an object of general attention and study) comprises a greater variety of subjects, than is found in most other countries. “ If * (as a late popular writer remarks) the stupendous Alps or Andes afford a more striking prospect to the mind of the contemplator, we have our Snowden, our Plinlimmon; if the mines of Peru or Golconda are explored for the purpose of increasing wealth, let not those of more real worth and usefulness be overlooked, which are to be found in almost every county in this kingdom. In contrast to the Gold, the Rubies, and the Diamonds of other countries, let us oppose the inexhaustable mines of Copper, Tin, and Lead scattered through England, many of which have been constantly worked for ages past, and yet at the present day shew no decline of their valuable stores. And though the precious metals, Gold and Silver, do not abound here as

* Introduction to British Zoology.

in some other countries, still they are occasionally found both in this country and in Ireland: in the latter, Silver is found in considerable abundance, in the Copper Ores of Muckruss, on the lake of Killarny.

ZINC is obtained in vast quantities from the mines of Somerset and Flintshires, and Black Lead or Wadd, (a substance of rare occurrence in other countries) abounds in the mountains of Cumberland and Derbyshire. Nor are other mineral substances wanting, our exhaustless strata of Coal, our Mines of Allum and Rock Salt; our Quarries of Marble and Stones of various kinds, our Clays and Earths are incontestable proofs of the intestine riches of Great Britain."

Of the Fossil remains of organized bodies so numerous and widely dispersed through this kingdom, some are found imbedded in rocks and stones, others in matrices of clay and earth, some are found at the greatest depths our miners have yet explored, others again only on the summits of our highest mountains; they are most numerous on chalky and hilly districts, and amongst shingle on the sea coasts: numerous valuable species are often obtained, in the excavation of wells: they principally consist of various species of *Echineæ*, Shells, *Crustaceæ*, and the teeth, tusks, horns or bones of animals, the species of which are not clearly defined, or are entirely unknown in the recent state.

The curiosity so deeply implanted in the mind of man, and which so frequently renders him restless and uneasy, unless engaged in exploring unknown paths, often occasions subjects of real insrinsic value, but of easy acquisition,

to be little regarded, and they are oftentimes less prized, than those beyond our reach: to facilitate the endeavours and assist the views of such, it has been the endeavour of the author to condense as much useful and practical information on the various subjects as was consistent with the proposed object, by pointing out the proper or most successful modes to be pursued in attaining a knowledge of the different subjects of Natural History, (foreign as well as native,) and of preserving the subjects when attained; and should the following pages be found to contain information useful to the practical Naturalist, or the Philanthropic Traveller, the object of the author, that of rendering himself useful in his humble sphere will be attained.

As the object of the Naturalist is not only to gain a personal knowledge of the different subjects of the science, but also to gain an insight into the habits, the economy, and usefulness (as applied to mankind) of the various species he may meet with, it may not be here inappropriately remarked, that every occurrence should be noted down as soon as possible after the observation has been made, as when the mind is continually on the search for fresh amusement, each succeeding object chases from the remembrance (at least for the time being) the occurrence which so lately excited our admiration and wonder; or as the poet most elegantly expresses

“Some lovelier wonder soon usurps its place,
Chased by a charm still lovelier than the last.”

Nothing contributes more to ease the mind, and render even our thoughts subservient, than method; it should be the

aim of every one to simplify his labour; and the want of a plan is too frequently the complaint of those who either through negligence or inattention, suffer opportunities of being useful to escape them unimproved; to remedy this neglect, and to supply the want above alluded to, we have annexed at the close of the different divisions, a sketch of a diary or calender, somewhat on the plan of that published many years ago by the Honorable Daines Barrington.

The Author takes this opportunity of acknowledging the assistance he has derived from various valuable publications, particularly from the Philosophical and the transactions of the Royal and Linnean Societies, works which contain papers of the highest importance and which will be read with interest in succeeding ages; yet from the voluminous and expensive forms of these works, they must of course be read by comparatively few, and the knowledge they contain can hardly extend beyond the sphere in which it was at first disseminated.

That it is not possible ever to form a complete history of all natural subjects, is evident from their immense variety, and from the intimate connexion subsisting between each; so that all we can expect from the observation of discerning men, whose attention may be directed to the same objects, is an increase of our present stock of knowledge, and from the gleanings of this general stock, something in the nature of a complete history may be formed. The parts forming this great whole, are so complex, their uses so varied, and their

functions acted upon in such an endless variety of ways, that, to enable any one to give a complete history of any plant or animal, he must become acquainted with the history of (perhaps I shall not be advancing too much, in saying,) every other existing substance; as, if it be a plant, the earth in which it resides, and from which it derives its support, the rain, the dews, the snows that nourish or protect it, the air in which it may be said to breathe, all form a part or are connected with its history; together, with that of the Quadrupeds which browse on its foliage; the Birds that nestle in its branches; the Insects that resort to it for food, and shelter; the Animals which these different classes tend to support, or at least contribute to the comfort of, have also equal claims in the history of our plant; that what with describing the plant, its air, its earth, its waters, its inhabitants, and the purposes to which these are severally applied in the economy of nature; the life of man would not suffice to give even an imperfect outline. It being obvious that it is these affinities and the contrasts they afford, that render the science of Natural History so particularly engaging, the urging the attention of the Naturalist to these particulars, will not appear trifling, and as they may not have occurred to every one, we would rather trespass, for a short time, on the patience of our better informed reader, than by neglecting the opportunity, suffer any one through ignorance or inattention, to miss those pleasures we have constantly found to attend this part of the study of Natural History.

In pursuing this idea, we would recommend to every

lover of science, that, on becoming possessed of any new species, whether it be a Beast, a Bird, a Fish, or a Flower, he endeavour to become acquainted with its affinities, its relations, its antipathies, its delights, not only as it regards the object immediately under examination; but also what part it acts or fills up in the general economy. Thus, I observe, a quadruped grazing beside a stream, in some sequestered vale, on approaching it, I discover it is greatly inconvenienced by the stings or wounds of innumerable insects, that are besetting it on every side, maddened with pain, the animal rushes for relief into the water, the insects, dislodged by this element are greedily devoured by the finny inhabitants of the stream; these latter are immediately siezed by birds of prey, who were awaiting the instant the fish should rise to the surface of the water. Our Quadruped relieved from its tormentors, quits this place and repairs to some distant forest, in its way it unavoidably crushes down the high grass and other herbage beneath its feet, the seeds of which cling to its skin, some by natural hooks and appendages supplied for the purpose, others attaching themselves to the fur, from the moisture it retains, and are by these means transported far from their native vale, to afford sustenance to other animals in distant countries.

By means equally simple the bounteous hand of a benevolent Creator spreads a table for his meanest creatures; nor do we meet with any thing like want in the wilds of nature; sudden accidents may undoubtedly reduce many of the lower classes of animals to a state of famine, but


this, like other casual circumstances, brings its attendant good.

To attempt to follow nature through all her intricacies, would be fruitless, but so far as we are permitted to follow her paths, we find them strewed with pleasantness, and while the contemplative mind breaks through the film of ignorance, it soars with clearer views towards perfection, sees with thankfulness the care a beneficent Creator has taken to forward his present happiness, and contemplating the vast mass of organized matter surrounding him on every side, rationally concludes with the pious Paley, "that such designs must have a designer, and that designer must be God."

ZOOLOGY.

CLASS I.

MAMMALIA. *Quadrupeds.*



AS Quadrupeds supply the greatest portion of Animal food to mankind, the study and knowledge of them, has proceeded with more rapidity, than that of the other classes of Animals.

They are divisible into *Carnivorous*, *Herbivorous*, and *Mixed* or general feeders. The Carnivorous Animals are all furnished with instruments capable of destroying and devouring their prey, their claws and teeth being large, strong, and sharp, their courage and strength great; their habits lonely and retired; feeding principally at night: but few of the kinds are gregarious; their flesh is tough and unfit for the purpose of food for Man. Their increase is not nearly so great as many other kinds, and in general they are longer lived.

From the several genera of the Carnivorous kinds, man has been able to reduce but very few species to a state of domestication; in fact the Dog is the only one that can be considered as perfectly reclaimed; he is the willing companion of man, seems to enter into the views and watches the motions of his master with a scrutinizing eye, and becomes the faithful guardian of whatever is committed to his charge; and whether we consider the Dog as a cheerful and useful companion in our sports or toils; or as the vigilant protector of our property; his being rendered subservient to our purposes is of inestimable value.

The domestic Cat though an attendant on our dwellings, seems to take no kind of interest in the concerns of those that feed and protect it, and as Buffon justly remarks, "is more attached to places than persons," as it frequently quits the house and retires to woods; it is of a very capricious nature, and though so far tamed as to become familiar and to take up its abode in our houses, yet the services by which it repays the shelter afforded, are only traits of a savage and unsubdued spirit; as from its infancy it delights in blood, and seems to take pleasure in tormenting those animals so unfortunate as to come within its grasp. It is not a little remarkable, that the carcasses of the Dog and Cat tribes seemingly afford the greatest treat to the Vulture and Eagle families, their counterparts in the next grand division of Animals.

The Weesel tribe are of considerable service to man, by their devouring Snakes, Reptiles, and many of the lesser kinds of Quadrupeds; but in default of these, they

will often commit depredations in poultry-yards, pidgeon-houses, and rabbit-warrens; a few species of this family are kept in a half domesticated state for the purpose of destroying vermin; but they are not easily rendered familiar. Of the Piscivorous kinds, the flesh is almost universally rejected; the only uses to which man applies any parts of these Animals, are their skins, for clothing and other purposes, their fat, to extract the oil, and the teeth of some few species for domestic purposes in lieu of ivory. The whole of them with the exception of the Otter, are untamed, the latter has been sometimes rendered so far familiar as to catch fish for its master which it will bring to shore and readily part with.

Most of the Animals that are general feeders, that is, devour indiscriminately either Animal or Vegetable substances, are considered as injurious to mankind, as the numerous tribes of Rats, Mice and their affinities; many species of which are of so destructive a nature, and their increase so prodigious, that were no checks opposed to them, but a short time would suffice, to enable them, to completely overrun the countries they inhabit; Birds of prey, Snakes, the tribe of Weesels, and the larger kinds of their own family, are their common enemies; and in default of other food they fall upon and devour one another. The Hog when in a state of domestication certainly ranks as a general feeder; though in the countries where it is found wild, it inhabits forests, and feeds principally on roots, forest seeds, and vegetables. In point of usefulness, the Hog stands pre-eminent; for though, whilst living, its form and manners are forbidding and disgusting, yet,

after death, every part of the animal is convertible to some useful purpose.

Of the *Herbivorous* or *Granivorous* kinds, man has selected a considerable number, which afford him a constant supply of food and clothing; others serve him as beasts of burden; he has been able to appropriate every part, of some of the kinds to his use; of others, the skin, the flesh, the fat, the horns, hoofs, or only the fur are useable, some contribute to his ease and comforts in one way, and some in another; as one affords him food; a second clothing; a third he uses either to ride or draw burdens or carriages; a fourth contributes to his pleasures and health, as an animal of chase; a fifth affords him an agreeable perfume, as Musk, Civet, &c. and thus the whole circle is constantly contributing to his support and welfare. In those countries where the Quadrupeds are few, their deficiency in variety are compensated by the numerous good qualities combined in one or two; thus, the REIN DEER constitutes, both living and dead, the chief riches of the inhabitants of the country where it is a native, supplying the place of the Ox, the Horse, and the Sheep; during its life it is used for draught and burden, its milk affords a wholesome and nutritious diet, either in its native state, or formed into cheese or butter; and when killed, its flesh, fat, entrails, blood, skin, horns and hoofs are all applied to some domestic use.

The Ox, Sheep, Goat, Deer, Horse, and their affinities, are so generally dispersed, and the uses to which they are applicable, so universally known, as not to require repetition in this place.

As a branch of the herbivorous class ; the extensive tribes of Apes, Monkies, and Macaucos, claim attention ; these are constantly on the watch, to take advantage of the labour and industry of Man, and are among his most formidable enemies in the warmer climates ; they are all *frugivorous*, and generally gregarious, associating in troops of many hundreds together ; and whilst the main body are devouring or secret-ing in their pouches what fruit, grain, or other produce, they can purloin, sentinels are on the look-out to give the earliest information of the approach of danger.

Of the Insectivorous Quadrupeds, as the Manis, Ant-eater, Bat, and their affinities, Man has availed himself of but few kinds, either for food or other purposes, their flesh being generally rank, and their skins or coverings rarely applicable to his uses.

In every department of Zoological research, we find much to admire ; the wonderful œconomy in the animal construction, so as not to expend either volume or power, without a proportionate advantage, is conspicuous in every object we inspect ; and whether it be the smallest Mouse or the gigantic Elephant we examine, we discover every part so justly formed for its particular use and purpose, that we are lost in admiration, at the consummate skill of their divine Creator.

The whole of the Mammiferous Animals are viviparous, and suckle their young from lactiferous teats. In interior as well as exterior conformation, the generality of Quadrupeds resemble Man ; being possessed of a *heart* composed of two *auricles*, and two *ventricles* ; *lungs* that respire alternately,

and warm red blood. Their *jaws* are incumbent and covered, within which their teeth are usually situated. Their organs of sense consist of the *tongue*, *ears*, *eyes*, *nostrils*, and *papillæ* of the skin. Their bodies are generally covered with hair or wool, excepting some of the amphibious or aquatic species, in which it is scantily afforded or entirely wanting. They are all furnished with four feet, except those of the order *Cete*, and a few species which rather possess fins than feet.

The greater number of these animals inhabit the surface of the earth; a few the depths of the ocean; and some reside either on land or in the water, as their necessities require; but not any of them can support life without inspiring atmospheric air.

Linnaeus divided the *Mammalia* into seven orders, the characters of which he has taken from the number, situation, structure, or absence of the teeth: as it may assist the *Naturalist*, and at the same time preclude the necessity, in a great measure, of encumbering himself in his travels, with other books, we proceed to enumerate the essential characters of each *Order* and *Genera*, annexing thereto a brief outline of their general history.

ORDER I. *PRIMATES*.

Front teeth cutting, the upper four parallel, except in some few species of *Bats*, which either have but two, or are without any: *tusks* solitary, that is, one on each side, in each jaw: *teats* pectoral: *feet* four, the two fore ones

are in the first three genera called *hands*: *nails* generally flattened, oval. Most of the animals belonging to this order feed on grain, fruits, roots, and vegetables, and some few on animals. The order consists of five genera.

1. *Homo*. MAN. *Front teeth* cutting, the upper four parallel; *teats* two, pectoral.
2. *Simia*. MONKEY. *Front teeth* in each jaw four, approximate: *tusks* solitary, longer, more remote: *grinders* obtuse. This numerous family is separated into five natural divisions,—APES, without *tails*. BABOONS, *tails* very short. MONKEYS, *tails* long, not prehensile; *cheeks* pouched; *haunches* naked. SAPAJOUS, *tails* long, prehensile; *cheeks* without pouches; *haunches* covered. SAGOINS, *tails* long, not prehensile; *cheeks* without pouches; *haunches* covered.

The species of this extensive genus are almost exclusively confined to the warmer parts of Asia, Africa, and America; they frequent woods, and are generally found in considerable numbers together; they are exceedingly injurious to gardens and plantations, feeding on fruits and grain; the whole tribe possess a large share of cunning, are extremely noisy, proverbially mischievous, and almost constantly in motion: they are sometimes taken in traps, but the best mode is to obtain them from their nests, as when reared from their infancy in confinement, they become more familiar than those obtained in an adult state. They constitute the food of various species of cats, snakes, and birds of prey.

3. *Lemur*. MACAUCO. *Front teeth* in the upper jaw four; the intermediate ones remote; in the lower jaw six,

longer, extended, compressed, parallel, approximate ; *tusks* solitary, approximate ; *grinders* many, sublobate, the foremost longer, and sharper.

This genus, like the preceding, is confined to the warmer parts of the globe: they usually nestle in trees, and are mostly frugivorous. Several of the species are easily tamed.

4. *Galeopithecus*. COLUGO. *Front teeth*, in the upper jaw wanting; in the lower six, short, broad, distant, pectinated; *tusks* short, broad, triangular, sharp, serrated; *grinders* four, truncated, muricated with conical protuberances; *body* and *limbs* surrounded with a *membrane*, by which the animal supports itself as with wings.

In habits it resembles the Macaucos, from which genus this (the only species) has been removed, on account of the differences above enumerated in their generic characters.

5. *Vespertilio*. BAT. *Teeth* all erect, sharp-pointed, approximate; *fore-feet* palmated; *body* furnished with a flying *membrane*, as in the last genus.

The whole family of Bats are nocturnal, or only make their appearance in the dusk of evening; their food consists of winged insects; some of the larger kinds will devour Mice and other small quadrupeds; and they are the prey of Owls. Their haunts are in dark noisome places, in caverns, vaults, and ruined buildings; they are easily obtained in their torpid state, which, in those species that inhabit the

colder climates, is during the winter months; they may then be found in clusters, suspended from the roofs of caverns and other dark retreats; they revive from their inactive state with the earliest warm weather, when they are rarely to be procured but by the use of the gun, or by means of a large net carried before a lighted lantern soon after dark, when they eagerly pursue the insects that fly towards the light, and become entangled in the net. This latter method is usually termed *Bat-fowling*.

ORDER II. *BRUTÆ*.

Front teeth wanting in both jaws: *feet* with strong hoof-like *nails*: motions generally slow: food vegetable substances and insects. There are nine genera in this order.

1. *Platypus*. *Teeth* none; *mouth* shaped like the bill of a Duck; *feet* palmated.

The only species of this genus forms an anomaly among quadrupeds; in fact, in general appearance it seems at first sight rather a monstrous or an artificial production, and was so esteemed when first brought to this country; it is an inhabitant of the estuaries of New Holland, and is so nearly an aquatic as only to repair to the shore in search of worms and aquatic insects, which it scoops from the mud in the manner of the duck tribe; it burrows in banks, having the entrance to its retreat under water.

2. *Bradypus*. SLOTH. *Front teeth* wanting; *canine teeth* obtuse, single, longer than the grinders, placed opposite;

grinders five in each jaw, obliquely truncate, cylindrical, the two anterior ones longer, far distant.

This genus is principally confined to South America, and has acquired its name from the extreme tardiness of the motions of all the species: their food consists of the fruit, leaves and young shoots of trees, and it is said that when one finds a tree the foliage of which is agreeable, it does not quit it while any leaves remain. They are with great difficulty obtained alive from their propensity to bite, as though they do not make any attempt to escape, yet they seize any thing with so firm a grasp as hardly to be made to forego their hold but with life; when attacked by dogs, they offer no resistance, but wait some favourable opportunity to seize their assailant, and repeated instances have occurred where Dogs have perished from the severity of their gripe. They are mostly natives of woody situations.

3. *Myrmecophaga*. ANT-EATER. *Teeth* wanting; *tongue* cylindrical, extensile; *mouth* terminating in a long narrow snout; *body* covered with hair.

This genus feeds principally on Ants, (whence their name,) these are procured by thrusting their worm-like tongues into the nests of those insects; and their tongues being viscous, the Ants in endeavouring to pass over them are effectually secured, and when the animals find a number of these little creatures adhering, they draw them, with their tongues, within their mouths and swallow the insects. All the species are natives of warm climates; they generally resort to low woody situations, particularly where the soil is light and sandy.

4. *Manis*. PANGOLIN. *Teeth* wanting; *tongue* cylindrical, extensile; *mouth* narrowed into a snout; upper parts of the body covered with bony moveable *scales*.

At first sight these animals bear a strong resemblance to the *Lacerta* tribe, which has obtained them the name of Scaly-Lizzard.

In general habits, food, and places of resort, this greatly resembles the last genus; but differs from it in being furnished with a scaly armour, which is so formidable that they do not fear the attacks of beasts of prey; as when attacked they roll themselves up, by bending the head between their fore-feet and wrapping their tails over it, in which position the edges of their scales are all erected; and in this state they will roll themselves down precipices without sustaining any injury. They are all natives of warm countries.

5. *Dasypus*. ARMADILLO. *Tusks* wanting; *grinders* short, cylindrical, seven or eight in each jaw; *body* covered with a bony *shell* intersected by flexible zones.

This genus principally inhabits South America. They feed on roots, fruits, vegetables, insects and worms; their flesh is esteemed a great delicacy, and on this account they are much sought after as articles of food.

6. *Rhinoceros*. *Horn* solid, perennial, conical, placed on the nose, but not adhering to the bone.

The *Rhinoceros* is confined to the hotter parts of Asia

and Africa; its habits are sullen and solitary; its food entirely vegetable, and its resorts mostly confined to the immediate vicinity of woods and swamps. The enormous bulk and prodigious strength of this animal is such as to enable it to bid defiance to the more savage inhabitants of the same climates, as from the terrible weapon with which it is armed, most animals would rather shun than seek to attack it.

7. *Sukotyro*. Horn on each side the head near the eyes.

8. *Elephas*. ELEPHANT. *Front teeth* wanting in both jaws; in the upper jaw the *tusks* are elongated; in the lower wanting; *proboscis* very long, prehensile; *body* nearly naked.

This is more widely dispersed than the Rhinoceros, but still is only found in the warmer parts of Asia, Africa, and Indian Islands; its strength is prodigious, and its docility when domesticated greater than that of any other quadruped. It is gregarious being usually found in companies, its food is vegetables and the young shoots and branches of trees. Its tusks are in great request as articles of commerce, under the name of Ivory, and are capable of being converted into various domestic articles.

9. *Trichechus*. MORSE. *Front teeth* (in the adult) wanting in both jaws; the upper *tusks* solitary; *grinders* in each jaw consisting of a furrowed bone; *body* oblong; *lips* doubled; *hind feet* stretched backwards, forming *fins*.

An amphibious genus, residing principally within the arctic circle; they feed on fish, molusca and other marine

productions; their tusks are used for the same purposes as Ivory.

ORDER III. *FERÆ*.

Front teeth conical, usually six in each jaw; *tusks* longer than the teeth; *grinders* with conical projections; *feet* furnished with subulate *claws*. There are eleven genera in this order, some of which feed on other animals and dead carcasses, others on worms, insects and vegetables.

1. *Phoca*. SEAL. *Front teeth* acute, the upper six parallel, the outer ones larger; the lower six parallel, distinct, equal, obtuse; *tusks* twice as long as the teeth, acute, large, solitary; the upper ones remote from the cutting-teeth, and the lower ones from the grinders; *grinders* five above, six below, narrow, tricuspidate; *ears* wanting; *hind-feet* finned.

This genus abounds on rocky shores and inlets from the sea, and are most numerous in northern countries: their food is fish, molusca and other marine produce. A great quantity of oil is obtained from their bodies, and their skins are in considerable request for various domestic purposes.

2. *Canis*. DOG. Upper *front teeth* six, the lateral ones longer, distant; the intermediate ones lobate in the lower six, the lateral ones lobate; *tusks* solitary, incurvate; *grinders* six or seven, or more in some species than in others.

The manners and habits of the Dog are too well known

to require particularizing; the other species of this genus are mostly wild and ferocious, and are the terror of the inhabitants of both hot and cold countries; the Hyæna and most of the other kinds abound in the warmer parts of Asia and Africa; while the Wolf and Fox kinds are most numerous in the colder regions.

Most of the species retire during the day to holes or caves, in woody situations, and only leave their retreats at night, to prey on such animals as do not possess sufficient strength to resist, or speed to elude their attacks. Most of the kinds are gregarious.

3. *Felis*. CAT. *Front teeth* six, the intermediate ones equal; *grinders* three on each side; *tongue* prickly backwards; *claws* retractile.

But few of the feline tribe are at all rendered subservient to the uses or purposes of man, at least whilst living; the domestic Cat and some few of the smaller kinds of Leopards are the only exceptions, and these however tamed, still, retain much of their original wildness and ferocity. They are all carnivorous and riot in the blood of the animals they overcome; their haunts are thick woods and forests, within which, in caves or dens they generally retire during the day; seeking their prey usually in the night.

4. *Viverra*. WEESEL. *Front teeth* six, the intermediate ones shorter; *tusks* one on each side, longer than the teeth; *grinders* more than three; *tongue* often aculeate backwards; *claws* not retractile.

Though of small size, the species of this genus possess all the thirst for blood so conspicuous in the preceding tribe. Some species are very injurious in warrens and preserves of game; others are essentially serviceable in destroying snakes, reptiles, and the smaller kinds of quadrupeds and birds; owing to this circumstance, several species are held sacred, particularly in warm countries; they mostly inhabit woody situations, and those common to northern regions principally resort to forests of pine, where they are regularly hunted during the winter, for the sake of their skins, which form an extensive part of the fur trade; some of the species have glands for the secretion of an unctuous matter, possessing a powerful scent, and known by the name of Civet.

5. *Lutra*. OTTER. *Teeth* as in the last genus; *feet* webbed.

Otters were formerly classed with the Weasel tribe, but have been removed by modern authors, and constituted into a separate genus: they are a piscivorous tribe, and commit great depredations in fish-ponds and rivers, their bite is exceedingly severe, and they are hardly to be obtained but by the use of the gun. They nestle in holes in the banks of rivers and ponds, which usually have the entrance beneath the surface of the water.

6. *Ursus*. BEAR. *Upper front teeth* six, hollowed within, alternate; *lower* six, the two lateral ones longer, lobed, with secondary or smaller teeth at their interior bases; *tusks* solitary; *grinders* five or six, the first approaching the tusks; *tongue* smooth; *eyes* furnished with a *nictitating membrane*; *Snout* prominent.

An uncouth and terrific tribe, mostly abounding in cold, woody, and mountainous districts; some species, particularly the Polar Bear, are found only in the coldest countries, being often seen floating on islands of ice, common to the seas in high northern latitudes; this last species feeds on seals, fish, the dead carcasses of whales, and has been known to attack men; some of the other species are carnivorous, and a few of them feed on fruits, vegetables and honey. The flesh of the latter kinds is held in considerable esteem as food, and hams cured from them are in great request; their skins are valuable for dresses and other purposes, and their fat is also in demand in many countries of Europe for anointing the hair.

7. *Didelphis*. OPOSSUM. Upper front teeth ten, minute, rounded, the two middle ones larger; lower eight, intermediate two broader, very short; tusks long; grinders crenate; tongue fringed with papillæ. Many species of this genus are furnished with an abdominal pouch, which covers the teats, and in which the young are secreted in times of danger, or to shelter them from cold; in some species the pouch is common to both sexes. A few of the kinds possess prehensile tails.

This curious genus is mostly confined to the New Continent; their food is various, some devouring small Quadrupeds, Birds, Reptiles, Insects and Worms, others feeding entirely on fruits, grain and vegetables; they are exceedingly nimble, climbing and leaping from tree to tree; their resorts are mostly confined to woody situations. The collector will do well to endeavour to procure the

young of the different species, as from the great similarity existing in many, it is highly probable that the species have been unnecessarily multiplied.

8. *Macropus*. KANGUROO. *Front teeth* in the upper jaw (of the adult animal) six ; in the lower two, very large, long, sharp and pointing forwards ; *grinders* five on each side of both jaws, distant from the other teeth ; *fore-legs* very short, *hind ones* exceedingly long ; *tail* long : the female possesses an abdominal pouch.

The Kangaroo has only been met with in New Holland, where it is used for the purpose of food, and the skin for various articles of dress and domestic uses ; its progress is not by running or walking, but by prodigious leaps, frequently to the extent of thirty feet at a single bound, and these are so rapidly repeated as to enable it to escape from the fleetest greyhounds. It feeds on grain and vegetables.

9. *Talpa*. MOLE. *Front teeth* in the upper jaw six, unequal, in the lower eight ; *tusks* solitary, the upper ones largest ; *grinders* in the upper seven, in the lower six.

This class reside principally beneath the surface of the earth, they feed on worms, insects, roots and seeds ; they are exceedingly prolific and are very injurious to the farmer and agriculturist, most abounding in campaign countries.

10. *Sorex*. SHREW. Upper *front teeth* two, long, bifid ; lower two or four, the intermediate ones shorter ; *tusks* many on each side ; *grinders* cuspidate.

A disagreeable little tribe, of a foetid smell and unpleasant aspect, they feed on worms and insects, and are generally found in the vicinity of water.

11. *Erinaceus*. HEDGE-HOG. Upper *front teeth* two, distant; lower two approximate; *tusks* in the upper jaw five, in the lower three; *grinders* four; back and sides covered with *spines*.

In woody situations this class is not uncommon; their food is beetles, worms, and vegetable substances, particularly fruits and roots that are in a state of putridity.

ORDER IV. GLIRES.

Front teeth cutting, two in each jaw, approximate, but remote from the *grinders*, *tusks* wanting; *feet* clawed, formed for running and bounding. The order comprises ten genera, which feed on roots, the bark of trees, flesh, fish and other animal and vegetable substances.

1. *Hystrix*. PORCUPINE. *Front teeth* two, cut off obliquely; *grinders* eight; *toes*, four on the *fore-feet* and four or five on the *hind-feet*: *body* covered with *spines* and hair.

Porcupines generally burrow in the earth, where they form capacious apartments, they usually quit their retreats towards the dusk of the evening, in search of food, which consists of fruits, roots, and vegetables: when alarmed they coil themselves up, and in this state their *spines* become erected, and they are then so completely armed that few animals will venture to attack them.

The flesh of some of the species is accounted delicate food ; their spines are used for pointing arrows, fish-gigs, and other purposes.

2. *Cavia*. CAVY. *Front teeth* two, wedge-shaped ; *grinders* eight ; *toes* on the fore-feet four or five ; on the hind-feet from three to five ; *tail* either short or wanting ; *clavicles* or collar bones wanting.

This is a prolific genus, some of the species producing from four to eight at a birth, and breeding many times in the year ; some kinds nestle in hollow trees, others burrow in the ground ; they are exceedingly timid, and retire to their nests on the smallest alarm ; they feed on vegetables ; the flesh of some kinds is eaten by the inhabitants of various countries.

3. *Castor*. BEAVER. *Upper front teeth* truncate, hollowed in a transverse angle, the lower transverse at the tips ; *grinders* four in each jaw ; *tail* long, depressed, scaly ; *clavicles* perfect.

The industry and ingenuity of the Beaver (when in a state of society) is perhaps greater than that of any other quadruped ; they associate in numbers of from thirty to sixty pairs, and form extensive ranges of buildings, of such strength and solidity, as to appear rather the work of some ingenious architect than the labour of brutes. They feed on the leaves and bark of trees, of the latter they accumulate a large store for their winter provision ; in default of which they devour crabs and fish ; they swim and dive admirably, and are capable of remaining under water for a considerable

time ; their haunts are on the banks of extensive lakes or rivers, far from the habitation of man. It is not a little curious, that their ingenuity seems entirely to quit them, or at least to lie dormant unless in society, as individuals or pairs, do not attempt even to burrow, when in their wild state. Their skins are among the most valuable of furs ; besides which, they are hunted for the sake of a secretion contained in glands situated beneath their tails, and which is the *Castor* of the shops.

4. *Mus*. RAT. Upper *front teeth* wedge-shaped ; *grinders* three, rarely two, on each side of each jaw ; *clavicles* perfect.

This numerous genus is widely extended, but few places being without some species or other ; some burrow in the ground where they lay up provision for the winter, others seek holes in rocks and trees for the same purpose, several species attach themselves to man, and live entirely on his labours ; some kinds become dormant or torpid during winter.

Their food is various, as fruit, roots, grain, flesh, crabs, and many of the smaller quadrupeds, even of their own kind ; also young poultry, eggs, and in fact some of the species will devour almost every description of animal substance ; some are migratory, and others nearly amphibious ; they are all extremely prolific, often producing eight to twelve at a birth, and this several times in the year, they are devoured by their own kinds, the Fox, Cat and Weasel tribes, as also by Birds of Prey, Snakes ; and the aquatic species are destroyed by Pike and other predaceous fishes.

5. *Arctomys*. MARMOT. *Front teeth* wedge-shaped, two in each jaw; upper *grinders* five on each side, lower four; *clavicles* perfect.

A cleanly shy family, the individuals of which all become torpid during winter; their habitations are formed under ground of several feet in extent, and lined with moss, dry grass, and other soft substances, which are placed at the extremity of their *caves*; these they rarely quit during wet weather; their food is grain and vegetables.

6. *Sciurus*. SQUIRREL. Upper *front teeth* cuneated, the lower acute; upper *grinders* five on each side, lower four; *clavicles* perfect; hair on the *tail* long, spread on each side: *whiskers* long. Some of this genus are furnished with a membranaceous appendage, capable of considerable extention, which assists to support them when leaping, as with wings.

This is a lively, active, elegant tribe, of gentle manners, easily tamed, but of a shy temper; they form their nests in the hollows or forked branches of trees, and compose them of moss, dry grass, and leaves; their food is the seeds of forest trees and fruit; they are mostly natives of woody situations, and except taken from the nest while young, they are not easily obtained but by the gun.

1. *Myoxus*. DORMOUSE. Upper *front teeth* two, wedge-shaped, the lower ones compressed sideways; *grinders* four in each jaw; *tail* hairy, round, thickened towards the tip; *front toes* four.

A very docile tribe, particularly lethargic, of very similar habits with the last genus, but less active; food and nests the same; may frequently be found in their dormant state in the decaying hollows of trees, together with quantities of nuts, acorns, beech-mast, &c. which are hoarded by these little animals, for food during wet and cold weather, as they rarely quit their nests but when the sun shines warm.

8. *Dipus. JERBOA.* *Front teeth two in each jaw; fore legs short, hinder ones very long; tail tufted at the tip.*

This is a very shy and timid genus, feeds entirely on vegetables, they are exceedingly swift, and make such amazing bounds as to bid defiance to all pursuit; like the last genus they sleep during the winter, in burrows which they form, extending many feet beneath the surface of the ground; at the extremity of these they place their beds or nests, which are composed of dry grass. In the cold weather they are readily obtained, by digging them out of their dormitories; they most usually prefer sandy plains, as this soil is easily excavated.

9. *Lepus. HARE.* *Front teeth two, upper ones double, having two smaller ones placed at the interior bases of the larger teeth.*

A timid persecuted tribe, being considered as animals rather created for the diversion of the indolent, than as filling up and forming a link in the great chain of nature: perhaps in no country are these poor harmless animals more maltreated than in this, where they are considered as the

property only of the rich and great; and many expensive establishments are kept up, for the express purpose of hunting them

————— “Detested Sport,
That owes its pleasures to another’s pain.”

All these animals are herbivorous, and are exceedingly swift of foot; the species are not numerous, though widely dispersed, but are most abundant in temperate climates; their flesh is in considerable request by most European nations, whilst the Arabians, Turks, and Persians, entirely reject it. Some of the kinds burrow in the ground, others form nests in the hollows or in the holes at the bottoms of trees, and our native Hare nestles on the ground in a clump of furze or dry grass. The skins of all the species are of considerable value, the fur or down being a principal ingredient in the composition of what are usually termed *Beaver hats*.

10. *Hyrax*. Upper *front teeth* two, broad, distant, lower four contiguous, broad, flat, notched; *grinders* large, four on each side of each jaw; *front feet* four-toed, *hind feet* three-toed; *tail* and *clavicles* wanting.

This genus burrows in the ground, and feeds entirely on vegetables; they are of a cleanly active disposition, extremely shy and timid, but when taken young, they soon become tame; they generally associate in large communities.

ORDER V. *PECORA*.

Front teeth in the upper jaw wanting; in the lower six or eight, remote from the grinders; *feet* hoofed; *teats* ingui-

nial ; several of the genera are furnished with *horns*, but such do not possess *tusks* ; and those that have *tusks*, are without *horns*: there are eight genera in the order, the whole of which are herbivorous.

1. *Camelus*. CAMEL. *Horns* wanting; lower *front teeth* six, spathiform; *tusks* distant, in the upper jaw three, in the lower two; *upper lip* cleft.

An exceedingly useful tribe, the individuals of which are mostly natives of warm climates, and are generally used as beasts of burthen. Without the Camel, the sandy deserts of Asia and Africa would be impassable to Man. The power of abstaining from, or rather of existing without drink, with which these animals are endued is almost past belief; instances are upon record, where Camels have passed eight or nine days, travelling over the burning sands of Arabia, without once allaying their thirst. Their food is vegetables and grain: neither the Camel nor Dromedary are at the present day found in a wild state; all the other species are very shy and timid, and are confined to the mountainous parts of South America.

2. *Moschus*. MUSK. *Horns* wanting; lower *front teeth* eight; upper *tusks* solitary projecting.

A wild and extremely shy genus, most of the species are natives of mountainous countries, feeding on vegetables, the flesh of the young is esteemed as food; from these Animals is obtained the perfume called Musk, from the value of which article, they are constantly the objects of pursuit. As soon

as any of the species can be obtained, the musk bag should be removed, as, should it be permitted to remain with the skin, the Musk will soon be absorbed, which, though it will contribute to preserve the skin from the attacks of insects, the perfume will be so strong as to be quite offensive.

3. *Cervus*. STAG. *Horns* annual, solid, branched, the tips thicker and covered with a downy skin; lower *front teeth* eight; *tusks* wanting, or solitary in the upper jaw.

The Animals called Deer, contribute largely to the comfort of Man, all the species are useable as food, and the skins and horns are convertible into various useful purposes; they are natives of mountainous and woody situations; several of the species are easily domesticated; their food is grass, the young shoots, branches, and bark of trees, also Mosses and Lichens. They are found in countries in the extremes of heat and cold.

4. *Cameleopardalis*. GIRAFFE. *Horn-like* projections two, simple, covered with skin; lower *front teeth* eight, broad, thin, the outer one on each side deeply bilobate.

The best account we have of this gigantic Animal, is in the travels of Mons. Le Vaillant, who found it in the interior of Southern Africa, it is the tallest of all known Quadrupeds, individuals having been seen, measuring seventeen feet in height. Its pace is an awkward amble, but it is so exceedingly quick, as easily to outrun the fleetest horse; it is very shy, and is amongst the rarest quadrupeds. It feeds on grass, and the leaves and shoots of the different species of *Mimosa*, so abundant in the forests of Africa.

5. *Antelope*. ANTELOPE. *Horns* hollow, persistent, round, twisted either spirally or annulately ; lower *front teeth* eight ; *tusks* none.

Antelopes usually associate in very considerable numbers, they are shy and timid in the extreme, possess an exquisite sense of smell, and mostly inhabit rocky or mountainous countries, they feed on the tender shoots of trees, on aromatic plants, and grass ; they are so exceedingly swift, as rarely to be taken but by the gun, or in pit-falls, which the natives dig and slightly cover with boughs of trees ; the flesh of all the kinds are occasionally used for food, and the skins are used for various purposes. Numbers fall a prey to predaceous Beasts and Birds ; and are likewise devoured by the larger kinds of Snakes.

6. *Capra*. GOAT. *Horns* hollow, wrinkled, turning backward ; lower *front teeth* eight ; *tusks* wanting ; *chin* bearded.

This like the preceding genus inhabits rocks and mountainous countries, they are wild, shy, and swift, but not to such an extreme as the last genus ; they feed on the bark of trees, grass and aromatic herbs, and are the prey of carnivorous Animals. Their skins are used for various purposes, and form an extensive article of commerce.

7. *Ovis*. SHEEP. *Horns* hollow, wrinkled, turning backwards and outwards, in a circular or spiral form ; in some kinds the horns are wanting.

A mild, gentle, and extremely useful race, all the individuals of which contribute to the comforts and necessities of Man, affording him a constant supply of food and clothing ; they are less active than the preceding, and prefer open plains or gently sloping hills ; and most of the species being in a state of domestication, are subject to considerable varieties both in form and colour.

8. *Bos. Ox.* *Horns* hollow, curving outwards and forwards, semicircular, smooth, annulated ; lower *front teeth* eight ; *tusks* wanting.

This “honest, harmless, useful” tribe of animals, constitute the wealth of many countries of which they are natives, being used for burden or draft, as occasion requires, their Milk supplying Butter and Cheese, their flesh food, their skins leather for various purposes, their horns and hoofs are applicable to numerous uses, their fat supplies tallow ; and in fact there is no part of the whole beast but what Man has turned to advantage. In a wild state they are of a fierce and violent disposition, associating in herds, frequenting marshy grounds in the vicinity of low woods ; they possess an exquisite sense of smell ; their food is grass and herbage ; the various species when domesticated, are subject to considerable varieties in form and colour.

ORDER VI. *BELLULÆ.*

Front teeth obtuse, truncate ; *feet* hoofed. This order consists of four genera, the two first of which are her-

bivorous and granivorous; and the two last feed principally on vegetables, but occasionally on animal substances.

1. *Equus*. HORSE. Upper *front teeth* six, erect, parallel; the lower six more prominent; *tusks* solitary, remote; *teats* inguinal; *feet* hoofed.

Several species of this genus contribute largely to the comforts and convenience, and are of inestimable value to Mankind. In a wild state, they are all natives of the hottest parts of the globe, associating in large herds, they usually resort to open plains, and feed entirely on herbage; they are exceedingly shy and swift, and are taken with great difficulty.

2. *Hippopotamus*. RIVER-HORSE. *Front teeth* in each jaw four, the upper in pairs, remote; the lower prominent, with the intermediate ones longer; *tusks* solitary, the lower ones very long, obliquely truncate, recurvate; *feet* hoofed at the margin.

This is a solitary species, inhabiting large rivers and lakes, principally in the interior of Africa; it only quits the water in the evening to feed, when it commits considerable damage to Rice and other plantations in the vicinity of its haunts; its pace on land is slow and heavy, but in the water it is very active, and walks with the greatest ease at the bottom of the water, its bulk is prodigious, frequently equalling that of the Elephant; it feeds on Sugar canes, Rice, and other vegetable substances; is lonely in its

habits, and does not willingly attack except in self defence ; an instance is on record of one that was wantonly attacked by some persons in a boat, who wounded the animal, which irritated it so much, that with its enormous teeth it tore off one end of the boat, and killed one or two of the party. According to Le Vaillant the flesh is palatable, the feet in particular are quite a delicacy ; the native inhabitants of Africa greedily devour the whole animal excepting the skin ; which is used for girdles and other purposes.

3. *Tapir*. *Front teeth* in each jaw ten ; *tusks* single, incurvate ; *grinders* five on each side of both jaws, very broad ; *hoofs* on the fore-feet four, on the the hind-feet three.

This is the largest of the native quadrupeds yet discovered in the New Continent, it inhabits thick woods in the vicinity of marshy ground, and also many of the extensive swamps so common in America ; its food consists of fruits, roots, grass, sugar canes, and also lizards and other reptiles ; like the River-Horse it swims, and walks with ease and facility beneath the water ; it roams abroad during the night, but is shy and timid ; it is mostly met with in considerable herds.

4. *Sus*. Hog. Upper *front teeth* four, convergent ; lower usually six, prominent ; upper *tusks* two, short, lower two longer, projecting ; *snout* prominent, truncate, moveable ; *feet* mostly cloven.

In their wild state, this genus are mostly of sullen and morose habits, some of the kinds feed on almost every

animal and vegetable substance, whether putrid or fresh; others devour frogs, lizards, snakes, and other reptiles; their dispositions are gloomy, and they mostly reside in the depths of forests, and excepting the Hog or common Wild Boar, they are all natives of warm climates. When domesticated, the Hog affords a considerable portion of food to Mankind, which has the faculty of taking salt more readily than any other kinds of flesh; on which account it forms a principal part in our naval provision, as when once salted it remains perfectly good in the hottest climates.

ORDER VII. CETE.

Feet wanting; *fins* pectoral; *tail* horizontal, flattened; *teeth* in some cartilaginous, in others bony; *nostrils* wanting, in lieu of which is a *fistular* opening, on the anterior or upper part of the head; *claws* or *hair*, none. This order contains four genera, the whole of which, though inhabiting the ocean and possessing the habits and manners of fishes, yet from their similarity of structure, their being viviparous, and giving suck, they necessarily class with the *Mammalia*, in common with which they possess a *Heart* composed of two *Auricles* and two *Ventricles*, warm red *Blood*, *Lungs* that respire alternately; moveable *Eyelids*; *Ears* hollow, receiving sound through the medium of the air; lactiferous *Teats*; *Vertebræ* of the neck, seven in number; *Lumber bones* and *Coccyx*.

Their food is molluscæ and other marine productions.

1. *Monodon*. NARWAL. *Teeth* in the upper jaw, two, long;

spiral, extending straight forwards ; *spiracle* on the fore and upper parts of the head.

2. *Balaena*. WHALE. *Teeth* wanting, instead of which are horny *laminae* in the upper jaw ; *spiracle* with a double opening on the top of the head.
3. *Physeter*. CACHALOT. *Teeth* in the lower jaw, none in the upper jaw ; *spiracle* on the head or snout.
4. *Delphinus*. DOLPHIN. *Teeth* in both jaws ; *spiracle* on the head.

All these genera are inhabitants of the ocean, and principally abound in the Northern Seas, where they associate in great numbers ; the first genus is only valuable on account of its teeth, which are of equal value with the finest Ivory. The Whale affords an immense quantity of oil, the horny laminae with which the interior of the mouth is furnished, is the article generally called *Whalebone*, and on account of these two productions, the Whale is an object of very considerable importance, as the catching of them, and the preparation of the oil, affords employment to a very considerable number of our population. The two last genera both produce oil, but neither of so good a quality, nor in the like abundance with the Whale.

The greater part of the foregoing genera being rendered subservient to the uses, comforts, or convenience of Mankind ; and being so widely and generally dispersed, it is particularly desirable to obtain information relative to the

purposes to which the different species are applied in other countries. No method is calculated to gain this information so satisfactorily as visiting foreign countries, and obtaining this kind of knowledge with the Animals themselves; as it often happens that much useful information may be gathered on this head by the inquisitive Naturalist, whose pursuits, if only confined to the mere procuring of new or rare kinds of Animals, though they may serve to amuse, are comparatively yet trifling additions to our present stock of knowledge; unless accompanied with the history, habits, useful properties, or other instructive information illustrative of the œconomy of the species thus obtained. As every addition to what is already known of the history of any species of Quadrupeds, must be considered valuable, we shall now proceed to point out those particulars, which should be more immediately attended to in this department.

On procuring an Animal with which we are unacquainted, the first point to which our attention should be turned, is to ascertain whether it is convertible into food, clothing, or is otherwise applicable to the uses of Man; whether its skin is of such a nature, as to be serviceable in trade or commerce; whether it possesses Glands for the secretion of Musk, or other unctuous matter; whether from its size or nature it is likely to be reducible to Agricultural purposes, and most particularly to what purposes, (if any,) and by what means, it is rendered subservient to the uses or comforts of the inhabitants of the country where it is a native; or should its habits be detrimental or obnoxious, what measures are pursued to destroy the species, or to avert its mischiefs.

Endeavours should be used to ascertain the food generally consumed by each particular kind ; its time of gestation, the number of young it produces at a birth ; at what age it arrives at full growth ; the differences in appearance in the different sexes ; whether as it advances in age, any particular change takes place in its general appearance, either by attaining Horns, Tusks, &c. &c. By attending to particulars of this kind, the practical Naturalist will not only obtain a mass of information amusing and instructive to himself as a Philosopher, but most probably of very considerable importance to the community at large ; and this he may render entertaining in the highest degree, by giving correct accounts of the modes pursued in different countries, to obtain the various kinds of Animals either for food, raiment, or amusement ; the plans adopted to reduce the wild Animals to a state of domestication, and by stating whether, when so domesticated they continue to propagate ; and what species are in general request either for domestic purposes or exportation.

It is obvious, that enquiries of this kind cannot fail of ultimately producing general good, as by becoming acquainted with the wants and products of distant countries, the attention of our Merchants and Manufacturers, will be naturally turned to the supplying those wants, and by the exchanging the manufactures of this country for the natural productions of others, reciprocal advantages must accrue.

To facilitate the enquiries of succeeding Naturalists, as well as to afford an opportunity of examination to the Man of Science, many plans have been at various times adopted,

with a view to preserve the skins of Animals, and to exhibit them in their natural forms, for which purpose the mode we have practised with the greatest success, we shall now proceed to detail.

Having obtained any quadruped which we are anxious to preserve, we take its measurement, as, by so doing, we are the better enabled to judge of its proportions when exhibited in a cabinet. The length of the Animal from the nose to the insertion of the tail, the length of the tail; the height at the shoulders and hips; the girth at the neck, breasts, and loins, and any remarkable appearance in the structure of any of its parts, should all be carefully noted.

In drawing or describing any Quadruped, the following particulars should be observed. The number, form, disposition or absence of the teeth, horns, and claws; if the latter are retractile as in the Cat tribe; the form of the feet or hoofs, whether the Animal be covered with wool, hair, spines or scales; does it possess any name; the form of its ears and tail, if the latter be prehensile, or is capable of being used as an auxiliary in seizing any object, or to assist it in escaping from any danger; if the posteriors are bare or callous, and if the Animal is capable of distending its cheeks, so as to form pouches, as in many of the Monkey tribe; or if possessed of abdominal pouches for the securing of their young, as in many of the Quadrupeds of New Holland; the color of the eyes should be noticed the instant the Animal is obtained, as almost immediately after death it is subject to change.

When the foregoing remarks have been made, the next object is to skin the Animal ; and as the value and appearance of a cabinet of Quadrupeds depends entirely on the perfect state of the skins, too much pains cannot be bestowed in the operation, which should not be commenced till some hours after the subject is dead ; as in that time the blood will have coagulated ; and there will be less danger of soiling the skin.

The Animal should be opened down the middle of the belly, and the skin stripped back to the knee and elbow-joints, which should be left with the skin, care being taken to remove all the flesh and integuments from the bones ; the skin may then be drawn over the neck and head ; the body is to be separated from the head at the first joint ; the surface of the skull must then be thoroughly cleared of all flesh ; the eyes, brain, tongue, and flesh in the interior of the mouth must be taken away, and freed of all loose skin or integuments, that may be attached ; when this is effected, the skin may be returned to its proper position ; and the cheeks must be filled out with cotton or other soft substance, mixed with a considerable quantity of antiseptic powder, composed of one third of white oxide of Arsenic, and two thirds of powdered burnt Allum ; this powder should be rubbed in the inside of the mouth, and all the cavities of the head, as the eyes, ears, and nostrils, should be filled with pledgets of cotton, dipped first in a strong solution of corrosive sublimate or Arsenic, and a quantity of the powder strewed into each place.

The inside of the skin, and the leg bones, when quite

clean from all loose skin, &c. should be rubbed well with the powder, this rubbing should be repeated occasionally until the skin acquires a considerable degree of dryness; if the Animal be large, the leg-bones cannot be conveniently retained attached to the skin, but in all cases where it is practicable, considerable advantage will accrue from their preservation;—this last remark applies also to the skulls of the larger Quadrupeds, which should in all possible instances be preserved, whether attached to the skin or not. Of such Animals as possess soft or spongy feet, the soles may be opened, and all the fat and muscular parts removed; after which, the powder should be applied plentifully, and before the skin becomes hard or dry, the cavities of the feet should be filled with cotton as directed for the head, and the incisions sewed neatly up.

When the skin is thoroughly dry, it should be so packed as (if possible,) to exclude insects; the drying should be performed in the shade, and the utmost vigilance is necessary in observing that no skin be packed till it is perfectly so: and to assist in drying, the skins should be kept distended, and exposed to the air. In skinning those Animals that are furnished with abdominal pouches, it would be better to open them longitudinally on one side, otherwise this curious character will be destroyed; and in all Animals possessing glands for the secretion of Musk or odour, these organs should be carefully preserved.

As a collection of skins necessarily occupies much time in procuring, to preserve them free from injury when obtained, is an object of the first importance. In order to

succeed in this, two principal causes of injury must be carefully guarded against—*Damp*, and the attacks of *Insects*; the former we generally have it in our power to avoid, but the latter assail collections of this kind in so many ways, and under such varied circumstances, that the collector must be ever on his guard; since it often happens that the very means used to destroy one kind of insect, calls into existence myriads of others equally destructive. As a general plan, we have succeeded best by exposing from time to time, the dry skins to the action of heat, which by repetition, though it may in a slight degree fade their colours, has the great advantage of eventually destroying all insects.

When a box is filled with skins, or rather when a box full is obtained, if circumstances will permit, the skins should be loosely placed in a large case with a glazed front, having all the seams or joints carefully stopped, by pasting strips of paper over them; in this state the case should be gradually brought before a large fire, where it may remain six or eight hours; by having a glass front, if any insects, particularly of the *Moth* kind, are amongst the skins, the heat will soon cause them to flutter about, and they can easily be perceived when dead. But lest any of the insects so destroyed, should have deposited their eggs on the skins, the frequent repetition of this plan is desirable, previous to the skins being finally packed.

When about to be packed, each skin should be wrapped in a separate paper, (the commonest brown paper is to be preferred in all cases, as it resists damp more than any other kinds, and is less liable to be devoured by insects,)

with a Memorandum of what particulars belong to it, as the having a duplicate of this kind, though it may trespass somewhat on the time of the Traveller, will not unfrequently amply repay him for his trouble. The skins should be packed as close as possible; and when the package is full, the joints and cracks should be stopped with pieces of paper pasted over them; but even in this, some caution is necessary, as paste affords a nidus to numerous insects, which frequently deposit their eggs on it, as a proper food for the larvæ when hatched. To prevent any unpleasant effects of this kind a considerable portion of Corrosive Sublimate or Arsenic, should be mixed with the paste before it is used; and when the paste is thoroughly dry, the places so covered should be washed over with a strong size, in which Arsenic or Sublimate is held in solution; the size may be formed of pieces of skin boiled in water, until completely dissolved, and the Arsenic or Sublimate should be mixed with it whilst hot. If previous to being put on ship-board, the cases could be covered over with a thick coat of oil paint, it would most effectually exclude both damp and insects. With these precautions, we have known skins of the most delicate species of Quadrupeds and Birds remain packed for three or more years, even in warm countries, without receiving any perceptible injury.

When a box of skins shall be re-opened, the skins should be exposed to the fire as before directed, after which they will be in a fit state to put up. This part of the undertaking is attended with a considerable portion of trouble, and to succeed well, requires no small degree of ingenuity. We recommend every person desirous of attaining perfection

in this art, to have a lesson or two from some skilful practitioner, as it is not an easy matter to succeed in a task of this kind from any instruction, without the assistance of practical illustration:

The best mode to pursue in setting up the smaller kinds of Quadrupeds, is, by forming a false body ; this may be done, with a piece of iron wire, of a substance proportioned to the size of the Animal, and should be of sufficient length, to pass through the skull, (if retained,) and to protrude a little, and also to extend rather beyond the tail ; the ends of the wire should be filed to sharp points, to prevent their tearing the skin ; and it should have previously been thoroughly heated in the fire, to render it quite flexible, this is to be wrapped round with tow or fine rope-yarn, till it is sufficiently large to fill out the skin ; lateral pieces of wire should be introduced through the soles of the feet, and when practicable through the leg-bones, and attached to the principal wire running through the body ; every part of the skin should be filled out to its full extent ; and some of the powder should from time to time be introduced with the stuffing ; the leg-wires must be sufficiently long to pass through the soles of the feet, and through a piece of wood capable of supporting the animal, to which it may be fixed, as it can then more easily be dried. Previously to the skin being stuffed, if a dried one, it will be necessary to wrap it in damp cloths for twenty-four hours or even longer, according to the size and substance of the skin, some of the largest Quadrupeds will even require thoroughly soaking in water for some days ; Animals of the size of the Horse, Ox, Rhinoceros, &c., will be most faithfully represented by having their skins supported by a frame

of wood, which will give them stability, otherwise from their weight they are liable to get out of shape ; but as it is hardly probable that the stuffing of this description of Animals will be attempted by any but a professor, we consider further remarks on this point unnecessary.

When the skin is filled out to its extent, it is to be carefully sewed up with strong double silk ; the Needle should be a curved triangular one, such as is used by Surgeons, the fur may then be smoothed over the seam, which will hardly be perceptible. The Animal should be placed in as easy and natural a position as possible, at the same time recollecting that natural effect ought not to give place to elegance of form. Before the skin is quite dried, the eyes should be inserted ; and to enable the operator to represent the Animal with eyes of their natural colour, it is desirable to have as correct a representation of them as possible ; glass eyes of all sizes and tints, are to be procured at the glass bead-makers, in London ; they should have a piece of wire attached to them, by means of which they may be securely fastened ; and to give them a natural appearance, they should be somewhat larger than the natural eye, and the eye-lids must be carefully brought forward so as completely to include, and which will reduce them in appearance to the natural size.

The next business is to dry the stuffed skin, which may be best done in a shady room, into which the air is freely admitted ; in a week or more, according to the bulk of the subject and the state of the atmosphere, the skin will be dry : but to dislodge any remains of moisture, it may be brought within the influence of a fire, but by no means close ;

after which it should be placed in a glass case, with the seams and joints closely pasted up; and lest any insects should be attached to the skin, it will be better that the case be baked, in the manner already directed, relating to the packing the skins. The skins of Animals that are in a recent state, should be treated in all respects as the foregoing, excepting that the skins should not be filled out to the full extent, as in drying, the skin is liable to shrink; fresh skins will also require much more of the antiseptic powder to be used when stuffing, as it absorbs the grease contained in the skin; and they will require longer time in drying, before they are in a fit state to place in cases.

The wires that pass through the legs, should be brought through the bottom of the case and there turned, by which the skin will be kept in an erect posture; and to prevent its weight inclining the Animal forwards, a piece of wire may be introduced through the back of the case and attached to the body, which will effectually prevent its moving, at any time the case may require to be taken down. As a pleasing relief, and to ornament the inside of the bottom of the case, a quantity of dried moss, finely powdered, and mixed with a little coarse sand, may be sifted over it, first moistening the ground with thin carpenter's glue; the ground may be further enlivened by introducing sprigs of moss or dried grasses.

To persons visiting foreign parts for the purpose of pursuing this study on a more extended field, we take leave to remark, that in all cases where it is practicable, the skins of both sexes in the adult state are particularly desirable, as also that of the young, when any remarkable difference is apparent; as for instance, the skin of *Felis concolor*, the

Puma or American Lion, is, (as its specific name imports,) of one uniform colour, whilst in its infancy it is spotted, afterwards the spots appear oblong, almost stripes, and when it attains its full growth, they entirely disappear.

As it may be more convenient, at the time of procuring many of the smaller species of Quadrupeds, to preserve them entire, till a more convenient opportunity offers for stuffing them, they may be safely put into glass or earthen jars, or small casks filled with one third spirit of wine, arrack, rum, or other spirit, and two thirds of a strong solution of burnt allum, care should be taken not to use, if avoidable, coloured spirit of any kind, as it frequently happens that when coloured, it will leave a stain on the lighter parts of the skin or fur, that cannot be removed. The solution of allum should be made by pouring one quart of boiling water on eight ounces of allum, and when cool, the water should be poured off, as some water will not hold that quantity in solution; and if a larger quantity be dissolved at any one time than is required, the water may be evaporated either over a fire, or by placing the solution within the influence of the sun, and the allum will be deposited in crystals, which only require being burnt over a common fire to be fit for using again. The preserving in spirits has this decided advantage, that at any subsequent period the Animal will be seen with all its parts perfect, and may offer interesting amusement at a more leisure moment, than often falls to the lot of collectors whilst absent from home.

To succeed in the different operations already enumerated, the traveller must be supplied with the necessary instruments,

and these in duplicate; such as DISSECTING KNIVES, SCISSORS; FORCEPS of different shapes and sizes; and what we have found particularly useful is an instrument known to Hardwaremen by the name of BUDDING KNIFE, and for which purpose it is in general use by Gardeners; the blade should be long and thin, and the handle thin, flat and rounded at the edges; besides these, PLIERS of different sizes and forms, as round, flat and cutting, are indispensable; NEEDLES of various sorts, as Surgeons' curved and flat needles, straight triangular needles, such as are used by Glovers; and the common kinds in variety. The latter, besides being useful to the traveller himself, may prove a most valuable present in distant countries, where the intercourse with Europe is but trifling or accidental. STRONG THREAD and SILK should not be omitted; but the latter is always to be used in sewing up skins. Various kinds of PAPER should likewise form part of the travellers investment; and particularly Coarse Brown Paper, as it is of more common request and possesses many advantages over the other kinds.

In the foregoing instructions the Author has endeavoured to avoid all unnecessary expence and trouble; the *antisceptic* he recommends, possesses all the requisites, and though simple, he feels confident it will be found equally efficacious with any of the most expensive preparations of the kind; but as it may not at all times be obtainable, any of the following articles may be used with a probability of success.

Ground or Whole Pepper and most kinds of Spices, avoiding those of an oily nature; ground Tobacco; Corrosive Sublimate; Sulphur; Musk, burnt Allum, (which may be pre-

pared by burning common allum over a fire till it looses its transparency;) Camphor; and the mere enveloping a skin in common brown paper that has been saturated with allum and arsenic in solution, has also been successfully tried.

As each practitioner has a method peculiarly his own, in performing the operations of skinning and stuffing Animals, the Author does not presume to say his is the best; but if simplicity joined to æconomy are worth attending to, his plan at least has these to recommend it.

To facilitate Naturalists in making their remarks on any Animal they may procure, a sketch of a table is annexed, which we would recommend to every person attending to Natural History, to have constantly in their pocket book; or at least some one on a similar plan; which may be procured at most Booksellers or Stationers, ruled to their own pattern: by having tables of this kind always at hand, opportunity is afforded of immediately putting our remarks on paper, without any delay, as it often happens that when subjects of this nature are committed to memory, others of equal interest soon after occurring, the ideas of both become confounded, and a difficulty is experienced in the separating the particulars of each.

Date	Memorandum.	Food.	Places of Resort, and Manners.	To what purposes applicable.	Length.	Girth.	Color.	Color of legs.	Notes.
1919, May 23	This day we discovered a small animal which was sporting amongst the shoots of the Cocoa Palm: we killed two, which proved to be male and female. On examination, we found it to belong to Order 4. Genus C. Squarrel.	It devoured the young leaves and shoots of the Cocoa Palm. Afterwards, having obtained one alive, we found it easily tamed, and that it eagerly drank of the wine made from the Palm Tree.	We found this species extensively dispersed from lat. ---, to ---; they associate in large numbers, and on the least noise, they lie lengthways along the branches, with their tails extended; at one time we observed them, greatly alarmed at the appearance of a Snake, which was making its approach along the branches; and though so terrified, that numbers let go their hold and fell to the ground, not any attempted to escape; the Snake having taken two or three, retired, and the Squirrels again resumed their sprightliness; we at various times noticed them devoured by the smaller birds of prey.	When the dry season is nearly over, the inhabitants go in numbers into their places of resort, and kill them by hundreds, either with blunt arrows or sticks; these are procured for the sake of their skins, which are in great request for the purpose of clothing, and every family is expected to present a certain number to their chief, every hunting season; besides which they part with them to neighbouring tribes in exchange for cattle, tobacco, and what European produce they can obtain.	Length of the Animal from the tip of the nose to the insertion of the tail, five inches; the tail three inches.	About four inches and a half.	Body grayish brown, with three longitudinal yellowish stripes; tail annulated with black and white.	Irides brownish yellow. Soon after death, the eyes loose all the yellow tinge and become blackish.	It is called by the Dutch inhabitants of the Cape, <i>Wieseleichorn</i> .

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Early this morning, we were surprised by an immense herd of Antelopes, that passed our encampment at about gun-shot distance; we learnt that they migrate twice a year, and were now on their route to the South-west, and they return again in about two months; by these migrations they are able to avoid the inconveniences of the rainy season, as also those of extreme drought. The Natives, as soon as they observe the first herd, dig pit-falls, which they cover with boughs, at the distance of ten or twelve paces apart, in some narrow pass, and often capture several hundreds in one day; they use the flesh for food, and the skins for various domestic purposes.

June 3. Saw a small herd of Zebras, but at such a distance as to be beyond the range of our rifles. During the whole of this night we were kept in a state of alarm from the continued howlings of Hyenas, and other wild beasts; but as we kept up large fires, and frequently discharged some of our fire-arms, we suffered no other inconvenience.

CLASS II.

AVES. Birds.

Ten thousand warblers cheer the day, and one
The live-long night ; not these alone, whose notes
Nice-finger'd art must emulate in vain,
But cawing ROOKS and KITES that swim sublime
In still repeated circles, screaming loud ;
The JAY, the PIE, and e'en the boding OWL
That hails the rising Moon, have charms for me.

COWPER.

THE beautiful and interesting Class, of which we now are treating ; is distinguished from the preceeding, by having the individuals composing its numerous families covered with *feathers* ; they with but few exceptions, are furnished with two *wings* and two *feet* ; and the whole class are *oviparous*.

In no part of the Animal Creation, are the wisdom, the goodness, and bounty of Providence displayed in a more lively manner, than in the formation and various endowments of the feathered tribes ; and whether we examine their ele-

gance and symmetry, their beauty and delicacy of colour, their peculiar habits and œconomy, or the wonderful adaptation of their parts for their different modes of living, we shall have sufficient cause for adoring the wisdom of their benevolent Creator.

No contrast can be greater than the tribes of Quadrupeds and Birds ; still there is a certain coincidence in several classes, that point out the same propensities and habits, and evince that, though different in form, the respective classes fill up a very similar space, and effect nearly the same objects in their different spheres. If we compare the EAGLE with the LION ; the VULTURE with the HYÆNA ; the whole tribe of PASSERENES with the RAT, SQUIRREL, and others of the same nature ; the extensive family of PARROTS, with the equally numerous, noisy, restless and entertaining tribe of MONKEYS ; the GALLINACIOUS tribe with that of the SHEEP, GOAT, and DEER ; the GUELMOTS, PENGUINS, PUFFINS, &c., with the WALRUS, the SEAL, and MONATI,—we must feel pleased at viewing the same general outline in their habits and œconomy, their modes of procuring, and kinds of food ; their tempers and dispositions not dissimilar ; their number of young corresponding or nearly so, the number of their natural enemies always corresponding in both classes with their greater or lesser increase ;—the harmony existing throughout the whole, affords a pleasing theme for contemplation.

Birds are divisible into two grand or primary Orders, the *Carnivorous* and *Granivorous* ; these are again divided into CARNIVOROUS, or those that feed on flesh ; PISCIVOROUS,

such as devour fish ; INSECTIVOROUS, those that prey on insects ; FRUGIVOROUS, such as consume fruit ; GRAMINIVOROUS which feed on grass or herbage ; and GRANIVOROUS, which feed on grain and seeds.

The individuals composing the Carnivorous Order, are all of a strong robust form, and are capable of enduring hunger for a great length of time, but cruel and voracious ; they are mostly furnished with long wings, and muscles of prodigious strength, by which they are enabled to keep on wing for many hours together ; a peculiarity of structure evidently necessary, as their food, consisting for the most part of other Animals, who are with themselves equally alive to danger, their appetites are only allayed by taking their prey by surprise : or where any of this order act as the "Scavengers of the Earth," their sense of smelling is necessarily exquisitely acute, to enable them to scent putrid carcasses at great distances. Were it not for the great power of wing dispensed to this tribe, they would be totally unable to subsist ; as the food the bountiful hand of nature has provided for their consumption, is so widely distributed, that without being gifted with superior power of exertion to carry them through the extensive journies they are necessarily obliged to perform, they would soon cease to exist ; but to counterbalance this fatigue, their food is frequently given with such a liberal hand, that when once satiated, they do not require a fresh supply for several days. It is to this unequal distribution of food, that the periodical migration of Birds must be placed.

The anatomy of Carnivorous Birds nearly resembles that

of Predaceous Quadrupeds, like which, they only possess one stomach ; they are armed with sharp *claws* for the securing and destroying their prey, and though not possessed of *teeth*, yet, from the structure of their *Bills*, they are enabled to cut and divide the Animals they overcome, with the greatest facility.

Granivorous Birds are furnished with intestines longer and larger than those in the Carnivorous kinds : their food is finally digested in the true stomach or *gizzard*, consisting of two muscles of vast power, in which the food is rendered fit for the operation of the gastric juices. To assist in comminuting the food, in the stomach of most of this tribe of Birds, are found numbers of small pebbles, which considerably assist the operation of digestion in the gizzard ; and when these stones are by friction rendered quite smooth, they are rejected, and their places supplied by others whose surfaces are less smooth.

The increase of this order of Birds is astonishingly great, so much so, that, should the increase of a single family, (Pidgeons for instance,) be permitted, without any cause operating to check it, it has been calculated that in a very few years, the surface of the whole globe would not produce sufficient to support them. Instead of the gloomy haunts of the forest, the inaccessible or frowning precipice, numerous species of this harmless useful family seem to court the company of Man, on whose labours they are content to rest principally for support. Their whole lives are occupied in hatching, rearing, and feeding their offspring ; in searching for seeds, fruit, worms and insects ; and in avoiding their

natural enemies and the snares of Man. Mild and inoffensive in their nature, Man (ever attentive to his personal interest,) has not failed to avail himself of these dispositions; and has selected from the different genera, such individuals as contribute most to his comfort and convenience. Of these, the most conspicuous are the Gallinaceous tribe, as also that of the Duck; both of which contribute to supply our boards, with a variety of light nutritious food; whilst their feathers and down are otherwise applicable to our uses.

Of the smaller kind of Birds (the *Passeres* of Linnæus) some delight us by the melody of their notes, others by their brilliancy of colour, whilst the instinctive powers many kinds exert in the construction of their nests, and the artifices they practise to allure the obtruder from their young, evince a degree of fore-thought bordering upon reason. Such kinds as build their nests in holes in trees, are generally of a colour nearly corresponding with that of the tree in which they build, which circumstance alone affords them great personal security; and for the preservation of their eggs and young, their nests are constructed of such materials as are least likely to excite or attract attention; if the tree be covered with ivy or moss, the nest is externally composed of green moss; but should the tree be overgrown with Lichens, or what is usually termed white moss; this material is used in lieu of the other.

Some kinds have the ingenuity to construct pendant nests, which are attached to the extreme tip of a branch, and have the entrance either from the underside, or laterally, by which contrivance the nests are secure from the attacks of various kinds of Monkeys and Snakes.

Many of the Aquatic Birds build floating nests; in the composing of which they interweave the stem or leaf of some living aquatic plant, by which their nests are secured from being carried away by the stream; and some kinds even use only so much of the living plant as may keep them secure, but at the same time permit the nest to rise or fall with the water; other kinds on quitting the nest (for food,) cover the eggs with decaying vegetables, to screen them from observation.

Birds are generally monogamous, only living together in pairs during the spring Months, or whilst rearing their young; after which they keep separate till the ensuing spring. Some few species keep constantly in pairs; as the Raven and some of the larger Birds of prey; whilst others, as the Gallinaceous kinds, are polygamous, each male having his seraglio of females.

The migration of Birds forms a remarkable feature in their history, and is deserving the greatest attention; by the arrival or departure of different species, our forefathers used to regulate their agricultural operations:—That of the *Swallow* has ever been a theme of admiration; their sudden appearance and departure has induced such a variety of opinions, that Naturalists are quite divided upon this point; this diversity of opinion has been occasioned by the sudden appearance of a straggling bird, during warm days, early in the spring. On the seventh of February, in the present year (1817), we observed a single chimney Swallow, flying about with all the alacrity so conspicuous in this tribe during the months of summer.

We have elsewhere remarked, that these Birds arrive in this country from the South in Spring, and return the same route in the Autumn. (See *British Ornithology*, under the head SWALLOW.)

This Class is divided into nine orders, the characters of which are drawn from the structure of their *Bills*, *Tongues*, and *Feet*: they are also further divided into *Land-Birds*, *Waders*, and *Water-Birds*.

DIVISION I. LAND-BIRDS.

ORDER I.

Accipitres.—RAPACIOUS.

The characters of this Order are, a hooked *bill*, upper mandible either dilated near the tip, or notched; *nostrils* pervious; *legs* strong; *feet* formed for perching; *toes* three forward and one backward; *claws* long and sharp. This order, according to Linnæus, consisted of four genera, the genus SERPENTARIUS is of modern date, and we have ventured to add a sixth, the genus PARUS; considering that it has every claim to be classed with other Birds of prey; as our native species of this family are all (with perhaps the exception of *P. biarmicus*, the BEARDED TITMOUSE,) at constant war with such small birds as they can master, frequently attacking Birds nearly twice their own bulk. We have known the *P. cæruleus*, the BLUE TITMOUSE, attack a CANARY-BIRD, (*Fringilla Canaria*,) which had escaped from a cage; and though we observed its escape, and not more than three

minutes elapsed before we found it, the Titmouse had brought it to the ground, and had picked out the greater part of the brain; this propensity runs through the whole genus; in fact, several of the foreign species would rank with either *Lanius* or *Parus*, without any considerable departure from the generic order, and the *Parus biarmicus* has been changed from one genus to the other by various Authors;—indeed it is known by the name of LEAST BUTCHER-BIRD as well as BEARDED TITMOUSE.

The four first genera feed principally on such Animals as they are able to overcome, or procure by stratagem; in default of which, dead and putrid carcasses are greedily devoured. The two last genera feed on small birds; insects, worms and some of the species will devour grain.

1. *Vultur*. VULTURE. *Bill* strait, hooked at the point; *head* and *neck* bare of feathers, with a naked skin in front; *tongue* cleft; *neck* retractile.

This is a tribe of Birds, which, though often disgusting in form, and always so in manners, ranks amongst the more valuable, and useful families; being generally natives of hot climates, where the putrifying carcasses of Animals would soon create pestilence, were it not for this and some other tribes appointed to consume putrid matter. Most of the species build a loosely constructed nest, composed of sticks; in rocky and mountainous situations, and they usually lay but two eggs. All of the kinds possess an exquisite sense of smell, and discover carrion, or other putrid substances at astonishing distances; they are of a shy and mostly of a

solitary disposition, and are rarely to be procured but by the gun ; sometimes they are taken in traps baited with the decaying carcase of some animal, particularly those of either the Dog or Cat.

2. *Serpentarius*. SNAKE-EATER. *Bill* strait, hooked at the point ; *tongue* entire ; *legs* very long ; *claws* short and blunt.

Of this genus there is only one known species, which has acquired the name of Snake-eater, from its propensity to devour the various kinds of Snakes ; it is a native of Southern Africa, where it is held sacred, on account of its ridding the country from noxious reptiles. One we saw was generally fed with live Eels ; which the bird killed by a stroke of its foot on the back ; as soon as the Eel was stunned with the blow, the bird invariably threw it into the air, and caught it in its bill as it fell to the ground.

3. *Falco*. EAGLE and HAWK. *Bill* hooked, covered at the base with *Cere*, in which the *nostrils* are situated ; *tongue* cloven ; *toes* three forward, and one backward, the middle one connected to the outer, as far as the first joint ; *claws* large, and greatly curved.

The species of this genus are exceedingly numerous, and very widely dispersed ; some of the kinds being found in almost every country, whether hot or cold ; they build their nests, some on inaccessible precipices, overhanging the sea ; others on the rugged tops of mountains, or on ruined and forsaken buildings ; some of the smaller kinds of Hawks con-

tent themselves with the deserted nest of the Crow; and others build in large trees; the larger kinds usually lay but two eggs, or if a third be laid, it rarely happens that more than two are hatched; they are all exceedingly long lived.

Most of this family feed entirely on living Animals; and only devour Carrion in default of other food, whereas the Vulture only attacks living Animals, when no other food offers. Many of the larger kinds are exceedingly destructive, feeding on Deer, Sheep, and other Quadrupeds, also on Birds, particularly those of the Gallinaceous tribe. They are sometimes caught in traps baited with live Animals; but they are generally so shy as scarcely to be obtained, except from the nest, or by the use of the gun. Twenty-four species are natives of Great Britain, for figures and descriptions of which, see *British Ornithology*, Vols. 1, 2, 3.

4. *Strix*. OWL. *Bill* strong and hooked, the greater part, including the nostrils, is covered with bristly feathers; *nostrils* oblong; *tongue* cleft; *toes* four, the outer one capable of being used either backward or forward; *claws* hooked and sharp; the exterior web of the outer *quill-feather* serrated. Some of the species of this genus have tufts of feathers, situated on the top of the head, which are longer than the others, and are erectable at pleasure, these are termed EARED or HORNED OWLS, in contra-distinction to those which are not furnished with these Ear-like appendages.

The principal part of this family are nocturnal Birds,

quitting their retreats in the dusk of evening, or by moonlight, at which times they pursue their prey; others may be often seen abroad during dark and cloudy days, beating the fields and hedges, in search of field mice, and small birds; and their flight is so extremely silent, that unless they cry, it is only accidentally they are discovered. They mostly build in hollow trees, rocky caverns, lofty towers, ruined buildings, and one species, the common Barn Owl, generally takes up its abode in Barns, and out-buildings; they feed on various kinds of small Quadrupeds, Birds, and even Snakes and Lizards. They may sometimes be caught in traps, baited with some living Animal. Nine species are natives of Great Britain, for figures, see *BRITISH ORNITHOLOGY*, vol. 1, 2, 3.

This and the preceding genera possess strong nictitating membranes.

5. *Lanius*. SHRIKE or BUTCHER-BIRD. *Bill* hooked, strait at the base, which is strongly beset with *bristles*; the upper mandible notched near the tip: *tongue* fringed at the tip; *toes*, three forward, one backward, the outer one connected to the middle toe, as far as the first joint: *claws* strong and hooked.

A wild and extremely shy genus, feeding principally on small Birds, and Coleopterous Insects; they mostly frequent woody situations, and are not easily obtained but by the gun. Three species are natives of England, for figures, see *British Ornithology*, vol. 2.

6. *Parus*. **TITMOUSE.** *Bill* compressed, strait, short, and sharp-pointed; *nostrils* covered with *bristles*; *tongue* laciniated; *toes* all separate, the hind toe the longest; *claws* sharp.

In food and habits, this genus agrees with the last; they frequent the same situations, as also orchards and gardens; their actions are lively and entertaining: several of the species are easily tamed; they are readily caught in traps, baited with raw flesh and fat. Seven species are British, see *British Ornithology*, vols. 1, 2.

ORDER II.

PICÆ. *PIES.*

This is a very extensive Order, comprising thirty-two genera, comprehending families, of manners and habits widely dissimilar; some nearly approach the Vultures, in their kinds of food, devouring the most putrid substances; others are a kind of birds of prey, some are insectivorous, others piscivorous, or vemivorous, many kinds feed entirely on fruits and seeds, some on grain, and other vegetable substances. Of this Order, but few individuals contribute directly to the assistance of mankind; the Rook, *Corvus frugiligus*; however is certainly an exception, as from its propensity to seek out and devour the grub or *larvæ* of the common Chafer, *Scarabeus Melolontha*, it rids the farmer of one his greatest enemies.

The character of this Order is, that the *Bill* is convex, compressed; with the *edges* (in most of the species) *cultrated*.

1. *Psittacus*. PARROT. *Bill* hooked, upper mandible moveable, mostly covered at the base with *Cere*; *nose-trils* rounded, situated near the base of the bill: *tongue* fleshy, obtuse, entire; *feet* formed for climbing, having two toes forward, and two backward. This genus is divided into MACCAWS; having the sides of the head bare of feathers; the tail long, and wedge-shaped. COCKATOOS, head crested; tail short, even at the extremity. PARROTS, sides of the head bare, without a crest, tail short, and even at the tip. PARRAKEETS, cheeks covered with feathers; *tail* pointed. LORYS, this division contains many of the most beautiful Birds of the genus, their predominant colours, are various shades of red; the cheeks are covered with feathers; in some species the tail is even, in others, cuneated.

Parrotts feed mostly on seeds and fruits, some devour the eggs of birds, and various kinds of small reptiles; they are all natives of warm woody countries, and are generally gregarious; they lay but two eggs, which are usually deposited in the decaying hollows of trees, or in holes, that have been previously occupied by some species of Woodpecker. When full grown, they are hardly to be taken alive; but the young, may be reared from the nest, and soon become quite tame and familiar; they possess the faculty of speaking, more perfectly than any other kind of bird, and resemble the human voice so nearly, as often to be mistaken for it.

2. *Ramphastos*. TOUCAN. *Bill* large, light, hollow, convex, serrated outwards at the edges, each mandible incurvated at the tip; *nostrils* long, narrow, situated behind the base of the bill; *tongue* long, and fringed at the edges; *feet* formed for climbing.

This genus feeds on seeds, berries, and the fruit of the different kinds of Palms; they are inhabitants of thick forests, and seek their food in small flocks, morning and evening, at which times they are very noisy, and so exceedingly intent on their engagements, as to suffer any one to approach sufficiently near to shoot them, without shewing any symptom of alarm; like the preceding genus, they deposit their eggs in holes in trees. They are all natives of South America.

3. *Momota*. MORMOT. *Bill* strong, slightly curved, serrated at the edges; *nostrils* covered with feathers; *tongue* fringed; *feet* formed for climbing or walking.

4. *Scythrops*. CHANNEL-BILL. *Bill* large, convex, sharp edged, *channeled* at the sides, hooked at the point; *nostrils* rounded, naked, placed at the base of the bill; *tongue* cartilaginous, bifid at the tip; *feet* formed for climbing.

This and the last genus, agree in habits, &c., with the TOUCANS; like which, they are natives of South America.

5. *Buceros*. HORNBILL. *Bill* convex, curving, sharp-edged, large, serrated outwardly, with a *horny protuberance*

at the base of the upper mandible; *nostrils* placed behind the base of the bill; *tongue* short, entire, sharp-pointed; *feet* formed for walking and perching.

This tribe feed on Lizards, small reptiles, fruits, seeds, and insects; they are generally inhabitants of woody situations, in the vicinity of swamps; some of the kinds are easily tamed, when taken young; they are dispersed through the warmer parts of Asia, Africa and America.

6. *Musophaga*. PLANTAIN-EATER. *Bill* strong, triangular, the upper-mandible elevated at the base, above the front; both mandibles toothed on the edges; *nostrils* placed in the middle of the bill; *tongue* entire, thick; *feet* formed for walking.

A genus, as yet only discovered in the interior of Africa; feeding on the fruits of the plantain; from whence it derives its name.

7. *Buphaga*. BEEF-EATER or OX-PECKER. *Bill* strait; inclining to square, *mandibles* gibbous, entire; *feet* formed for walking.

This genus feeds on the larvæ of such insects, as are deposited in the skins of Cattle, Deer, &c.

8. *Crotophaga*. KEEL-BILL. *Bill* compressed, semi-oval, arched, carinated on the back; the upper mandible angular on the edges; *tongue* flattened, pointed at the tip; *nostrils* pervious; *feet* formed for climbing.

The Keel-Bills feed like the preceeding; are generally met with in small flocks; and mostly inhabit South America.

9. *Glaucopis*. WATTLE-BIRD. *Bill* incurvated, arched, the lower mandible shorter; carunculated beneath the base; *nostrils* depressed, half-covered with a subcartilaginous membrane; *tongue* subcartilaginous, divided and fringed at the tip; *feet* formed for walking.

A native of New Zealand, feeding on seeds, fruit, insects, and small birds; inhabit thickets, but is most usually seen on the ground.

10. *Corvus*. CROW. *Bill* convex, strong, edges cultrated; most species have a notch near the tip; *nostrils* covered with setaceous recumbent feathers; *tongue* cartilaginues, bifid; *feet* formed for walking.

Some species of this genus is to be found in almost every country, their habits are similar, feeding on fruit, grain, worms, insects, small birds, and carrion; most of the kinds are gregarious, some build in large communities, as the Rook; their nests are mostly placed on trees, clefts in rocks, old ruined buildings, lofty towers and steeples. They are a crafty tribe; of familiar manners, easily tamed, and particularly addicted to the pilfering of glittering substances. Eight species are natives of Britain. (See *British Ornithology*, vols. 1, 2.)

11. *Coriacias*. ROLLER. *Bill* sharp-edged, bent in at the point, naked at the base; *nostrils* narrow, naked;

tongue cartilaginous, bifid ; *legs* short ; *feet* formed for walking.

A very splendid genus, in manners nearly allied to the last ; they are of a shy disposition, and not easily obtained but by the gun. One species only is found in Europe, and that but rarely in this country. (See *British Ornithology*, vol. 3.)

12. *Oriolus*. ORIOLE. *Bill* conical, convex, strait, sharp-pointed, edges cultrated ; the upper mandible slightly notched ; *nostrils* small, partly covered ; *tongue* bifid, sharp-pointed ; *feet* formed for walking and hopping.

The Orioles are a noisy, gregarious, numerous tribe principally natives of warm countries ; they usually nestle in woods, forming curious pendulous nests ; which have the entrance placed either on one side, or beneath, by which structure they are rendered secure from the prying curiosity of the Monkey, or the depredations of the Snake tribe. Only one species is found in Europe, and that very rarely in this country ; for a figure and description, see *British Ornithology*, vol. 3.

They feed on grain, seeds, insects, and worms.

13. *Gracula*. GRAKLE. *Bill* convex, slightly incurvate, sharp-edged, partly naked at the base ; *tongue* fleshy, entire, pointed ; *feet* formed for walking.

Not any of this genus are found in Europe, they feed on

fruit, insects, and worms ; build in trees, and holes, are easily tamed ; and soon learn to imitate the human voice.

14. *Paridisea*. BIRD OF PARADISE. *Bill* covered at the base with downy feathers ; *feathers* on the sides and breast, very long ; two of the *tail-feathers* long, naked, bristly ; *legs* strong, coarse, covered with large scales.

A most splendid and highly curious genus : of their habits or œconomy but very little is known ; their skins only have been imported into this country ; they mostly inhabit New Guinea, and the Indian Islands ; and are said to feed on the fruit of the different kinds of spice trees, particularly on those of the Nutmeg and Clove. From the strength and form of their bills and claws, we should be disposed to consider them as assimilating in their habits and food, with the Crow tribe. Their nest, eggs, and general œconomy, are among the desiderata of European Naturalists.

15. *Pogonius*. *Bill* large, thick, beset with reflected bristles at the base, the upper mandible *two toothed* on each side ; *nostrils* covered with bristles ; *feet* formed for climbing, having two toes backward, and two forward.

16. *Trogon*. CURUCUI. *Bill* hooked, both mandibles serrated, and sharp-edged ; *nostrils* covered with bristles ; *feet* short, downy, formed for climbing.

A shy solitary genus, living mostly in damp unfrequented woods, and feeding principally on insects and worms. They are mostly confined to South America and India.

17. *Bucco*. BARBET. *Bill* sharp-edged, laterally compressed, notched on each side near the tip, edges bent inwards; *gape* extending beneath the eyes; *nostrils* covered with incumbent feathers; *feet* formed for climbing.

The Barbets are all natives of warm climates; of dull heavy dispositions; they most usually reside in the vicinity of swamps, and feed on the smaller kinds of reptiles, insects, and worms.

18. *Polophilus*. COUCAL. *Bill* strong, cultrated, incurved; *nostrils* strait, linear; *feet* simple, having two toes forwards, the *outer one* of which is the longest, and two toes backward, the *inner one* furnished with an exceeding long *claw*.
19. *Phœnicophæus*. ΜΑΛΚΟΝΙΑ. *Bill* strong, incurved, the sides beset with stiff bristles, the ridge of the upper mandible flattened; sides of the head, including the eyes, covered with bare *carunculated skin*; *nostrils* covered with bristles; *feet* simple, the exterior back toe, the longest.
20. *Orphæthus*. ΤΟΥΡΑΪΟ. *Bill* short, strong, arched above, compressed at the sides, and toothed from the middle to the tip; *nostrils* covered with silky feathers; *feet* as in the last genus. In habits and œconomy, this and the two preceding genera very much resemble the Cuckoo, with which genus they have been connected by some Authors.

21. *Cuculus*. CUCKOO. *Bill* strait, slender, soft and slightly incurved; *nostrils* somewhat prominent; *tongue* short, pointed; *tail* composed of ten flexible feathers; *feet* formed for climbing; *toes* two forward, and two backward.

A very numerous tribe, feeding principally on caterpillars, and the larvæ of insects; they are widely dispersed; but only one species is European, the *C. canorus*, whose habits and æconomy correspond with the others of this genus. The Cuckoo does not build any nest, but deposits its eggs in the nests of other birds, to whose care it leaves the hatching and fostering of its young; it is a migratory bird, arriving in England early in April, and quitting us in August and September. (See *British Ornithology*, vol. 2.) All the kinds affect warm woody situations.

22. *Indicator*. HONEY-GUIDE. *Bill* strong, conical, broad at the base, gradually narrowing to the tip, upper mandible arched and keeled, the lower one incurving at the tip; *nostrils* partly covered with feathers; *feet* as in the last genus.

Inhabits the interior of Africa, where it is said to feed on the honey, collected by the wild bees, but being unable to obtain it itself, by its note, points out to the inhabitants the nests of the Bees; on this account it is held in such esteem, as to be considered criminal to destroy it.

23. *lynx*. WRYNECK. *Bill* round, and somewhat incurvated; *nostrils* bare, and concave; *tongue* long,

slender, cylindrical, terminated with a horny point; *tail* composed of ten flexible feathers; *feet* formed for climbing.

Of this genus, only one species is known, and that is an inhabitant of this country; its usual haunts are in the vicinity of woods or orchards; its food consists of ants, and other small insects; which it secures by a viscid matter, covering the tongue; for figure and description, see *British Ornithology*, vol. 2. This is a migratory Bird, usually preceeding the Cuckoo, in its arrival and departure.

21. *Picus*. WOODPECKER. *Bill* strait, angular, wedge-shaped at the tip: *nostrils* covered with recumbent setaceous feathers; *tongue* long, cylindrical, beset at the point with reflected bristles, tip horny: *tail* composed of ten stiff sharp-pointed feathers; *feet* formed for climbing.

A very numerous genus, dispersed over most of the temperate and warmer parts of the globe; their general resorts are woody situations; they feed on insects and their larvæ, for the latter, they often perforate trees to the depth of several inches, to get at the chrysalids deposited in the heart of the tree; some of the kinds feed on ants, which they procure by thrusting their worm-like tongues into the nests of these insects. They deposit their eggs in holes, which they excavate in trees, and are of a wild and shy nature, five species are natives of the British Islands, for figures, see *British Ornithology*, vols. 1, 2.

25. *Sitta*. NUTHATCH. *Bill* strait, strong, pointed ; *nostrils* small, covered with bristles ; *tongue* short, horny and jagged at the tip ; *toes*, three forward and one backward, the middle toe joined to the other two at the base ; *feet* formed for walking and climbing.

These are very shy solitary birds ; retiring to the shades of woods and forests ; they build or rather deposit their eggs, in the holes of trees, very frequently in those deserted by the last genus ; these they accommodate to their own size, by stopping up the entrance with clay, leaving only sufficient room for egress and regress : they feed on nuts, beech masts, and other forest seeds ; also on insects and larvæ, in search of which they may often be seen running up and down the trunks and branches of trees. There is only one European species, and that is a native of Great Britain, see *British Ornithology*, vol. 3.

26. *Todus*. TODY. *Bill* blunt, pointed, depressed, strait, the base beset with bristles ; *nostrils* oval, small ; *feet* formed for walking.

All the species of this genus are extra-European, and most of them are natives of South America ; they feed usually on insects and worms ; and generally resort to low thickets, in the vicinity of water.

27. *Alcedo*. KINGFISHER. *Bill* long, strait, somewhat triangular, thick at the base, sharp-pointed ; *tongue* broad, short, entire, pointed ; *nostrils* small, and in most species, covered with feathers ; *legs* short ; *toes*

three forward, one backward, three lower joints of the middle toe connected to the outer one; the middle toe *serrated* on the under side.

The Kingfishers all reside in the vicinity of rivers and lakes, in the banks of which they usually form their nests, being merely excavations, lined with the castings of the birds, which soon harden and render their retreats water-proof. They are piscivorous, exceedingly shy, fly with astonishing rapidity; and are among the more splendidly coloured birds, the predominant colour is blue, of various shades; only one species is found in Great Britain, see *British Ornithology*, vol. 1.

21. *Galbula*. JACAMAR. *Bill* long, strait, pointed, inclined to quadrangular; *nostrils* oval, situated at the base of the bill; *tongue* short, pointed; *feet* formed for climbing.

Mostly natives of South America, residing in the neighbourhood of swamps, and feeding on insects; they are very shy, swift on wing, and brilliantly coloured; and are only to be obtained by the gun.

29. *Merops*. BEE-EATER. *Bill* quadrangular, carinated, incurvated, pointed; *nostrils* small, placed near the base of the bill; *tongue* slender, in most species, jagged or fringed at the tip; *toes* three forward, one backward, the middle one connected to the outer as far as the first joint; *feet* formed for walking.

The Bee-Eaters, are mostly of gay plumage ; and with the exception of one (*M. Apiaster*,) natives of the warmer parts of Asia, Africa, and America ; they are most commonly found in open campaign countries, frequently resorting to plantations ; they are gregarious ; easy of approach, and not at all shy ; their name is acquired by their propensity to devour bees-and wasps ; they feed on most kinds of winged insects, as also grubs and worms, and in default of these, on grain. The European species (*M. Aipaster*, the COMMON BEE-EATER,) has occasionally been met with in this country, in small flocks ; they are migratory, quitting the hotter parts of Europe in the spring, and retiring to the more temperate regions ; till autumn ; see *British Ornithology*, vol. 3.

30. *Upupa*. HOOROE. *Bill* long, slender, curving downwards at the tip ; *nostrils* small ; *tongue* small, obtuse, triangular, entire ; the middle toe connected to the outer one, as far as the first joint ; *feet* formed for walking.

Some of this genus vie with the Paradise Birds in splendour, of colouring, and far surpass them in elegance of form, they are mostly natives of the hotter parts of Asia, Africa and America, they are generally insectivorous ; and inhabit woody situations ; they are all extremely shy ; but one species is European, (*U. Epops*,) this is sometimes met with in England ; but is not a constant visitor. (See *British Ornithology*, vol. 1.

31. *Promerops*. *Bill*, *tongue*, and *nostrils*, as in the pre-

ceding genus ; *toes* divided to their base ; *feet* formed for walking ; *tail* cuneated.

This genus is nearly allied to the last, with which it agrees in habits, æconomy, and the species are generally confined to the same countries.

32. *Certhia*. CREEPER. *Bill* slender, much curved, slightly triangular, sharp-pointed ; *tongue* in some species entire, in others fringed or bifid ; *toes* three forward, one backward ; *claws* long and much curved ; *tail* composed of twelve harsh, sharp-pointed feathers ; *feet* formed for walking or climbing.

The Creepers are a numerous family, abounding in the warmer parts of Asia, Africa, and America ; many of them vie in brilliancy with the Humming Birds, from which they are principally distinguishable by the form of their tongues. They have obtained the name of Creeper, from the facility with which they creep up and down the trunks of trees, in search of insects, which constitute their general food ; they are very shy, and are confined to forests and woods ; only one species, the (*C. familiaris*) COMMON CREEPER, is found in Europe, and that very commonly in this country. (See *British Ornithology*, vol. 1.

33. *Trochilus*. HUMMING-BIRD. *Bill* longer than the head, subulate, cylindrical, upper mandible extending over the sides of the lower one : *tongue* tubular, filliform, divided at the tip, into two worm-like threads, which coalesce at the base ; *feet* formed for walking and

perching; *tail* composed of ten flexible feathers. This extensive genus is divided into two sections; the one containing those species possessing *strait bills*, and the other, such as have their *bills curved*.

In this genus are found the smallest of the feathered tribes; as well as many whose colours far surpass in brilliancy, any attempts either of imitation or description; their food consists of the nectariferous juices, secreted in tubes of flowers, which they extract like Bees, by introducing their tubular tongue, into the flowers whilst on wing; they are constantly to be seen during fine weather, fluttering about the various flowers common to tropical climates; they are found in various parts of Asia, Africa, America, and the adjacent islands. The whole tribe are exceedingly tender, and from the nature of their food, will hardly bear confinement; attempts have been made to bring them alive to this country, but which we believe have universally failed; they will for a short time subsist on sweetmeats, but soon perish. From their diminutive size, they can scarcely be obtained by the gun, without being greatly injured in plumage: the net we have figured for the purpose of catching insects, or one made on the same principle, but of somewhat stouter materials, may be successfully used for these birds, taking care to have the handles of greater length than is necessary for the capturing of insects; the Birds thus taken, may be destroyed without injury to their feathers, by gently squeezing them across the breast with the thumb and finger.

ORDER III.

PASSERES. *PASSERINE.*

The species contained in this Order, are very numerous ; many of them possess a melodious note, and the greater part are applicable to the purposes of food for Man. A large proportion delight us by the elegance of their plumage ; but more, by the ingenuity displayed in the construction of their nests, and the artifices they practise for securing their young. Some of the genera feed on insects, and grain ; others on fruits, berries, and seeds, and many on insects, worms and snails. Most of those that are natives of this country are migratory, either resorting here in the spring for the purpose of rearing their young ; or on the approach of winter, seeking food, and shelter, from the rigour of more northern climates.

The characters of the Order are a conical, pointed *Bill* ; *nostrils* oval, pervious, and naked, *feet* formed for hopping, walking and perching ; not any of them are climbers. There are sixteen genera in the order, which are divisible into *hard* and *soft-billed* ; the former feeding on seeds, berries, and snails ; the latter on insects and pulpy fruit.

1. *Sturnus*. STARE or STARLING. *Bill* strait, depressed ; *nostrils* surrounded with a prominent rim ; *tongue* cleft ; *legs* strong, covered with large scales ; *toes* three forward, and one backward, the centre one connected to the outer as far as the first joint : *feet* formed for running and perching.

This genus, with the exception of one species, are all natives of warm countries, they are usually gregarious, feeding on berries, snails, slugs, and coleopterous insects; they mostly affect marshy places, and generally roost upon the ground. They nestle sometimes in old ruined buildings, steeples, lofty towers, the hollows of trees, and likewise in holes forsaken by Woodpeckers. They are a noisy restless tribe, many of them very splendidly colored; in flying they pursue a horizontal direction with a continued regular vibration of their wings, without any of those undulations, which are common to most other kinds. The European species is the COMMON STARLING. (*S. vulgaris*,) *British Ornithology*, vol, 2.

2. *Turdus*. THRUSH. *Bill* strait, the upper mandible slightly curving towards the tip, near which in some species it is notched; *nostrils* naked; *tongue* jagged at the point; the *sides* of the *mouth* furnished with stiff *bristles*; *feet* and *toes* as in the last genus.

Most of the Thrushes are song birds, on which account a large variety of the species are kept in confinement. They are widely dispersed, some or other of the kinds being found in most parts of the globe; woody places, orchards, and low coppices, are their favourite resorts; most of the European species are migratory, retiring northward in the Spring, and southward in Autumn: they feed on berries, snails, slugs, and worms. Eight species are common to this country. See *British Ornithology*, vols. 1, 2, 3.

3. *Ampelis*. CHATTERER. *Bill* strait, convex, curving

towards the point, upper mandible slightly notched near the tip; *nostrils* covered with reflected bristles; *feet* and *toes* as in the preceding genus.

A very splendid genus; most of the species are natives of America, some few of Africa, and one of Europe, the BOHEMIAN CHATTERER, (*A. Garrulus*,) which is an occasional visitant in this country: they affect wooded situations, and feed principally on berries and snails; our species is distinguishable by some brilliant scarlet appendages, which tip the extremities of the secondary quill and tail feathers. *British Ornithology*, vol. 1.

4. *Colius*. COLY. *Bill* short, thick, convex above, flat beneath; upper mandible curving towards the point; *nostrils* small, situated near the base of the bill, and nearly covered with feathers; *tongue* fringed at the tip; *tail* long, wedged shaped.

Most of the Colys are natives of the interior of the Cape of Good Hope, others of India, and a few of New Holland; but not any are found in Europe. They feed on berries, seeds, and grain, are shy birds, and are usually seen in small flocks.

5. *Loxia*. GROSBEEK. *Bill* strong, convex, thick at the base, the edges of the upper mandible curving inwards, both *mandibles* moveable; *nostrils* small, naked, situated at the base of the bill; *tongue* lacinated; *toes* three forward, one backward; *feet* formed for hopping and perching.

An extensive genus, the majority of which inhabit the warmer parts of Asia, Africa, America, and the neighbouring Islands ; in so large a variety as this genus contains, a great variation, is observable in the æconomy and habits of the different species ; generally they are inhabitants of woody situations, and many of the kinds construct very elegant, compact, pendent nests ; of the instinct possessed by some of the foreign kinds, we shall transcribe from *Turton's Linnæ*, the following account. "The PHILIPINE GROSEBEAK, (*L. Philipiana*,) constructs a curious nest, with long fibres of plants, or dry grass, and suspends it by a kind of cord, nearly half an ell long, from the end of the slender branch of some tree, that it may be inaccessible to Snakes, and other injurious Animals ; the interior part consists of three divisions ; the first is occupied by the male, the second by the female, and the third contains the young ; in the first apartment, where the male keeps watch, (while the female is hatching,) a little tough clay is placed on one side, and on the top of this clay a *Glow-worm*, which affords the inhabitants light in the night time." Other kinds display equal ingenuity in the construction of their dwellings, where they have the same common enemies to contend with ; in this country, where they have but little to fear on account of their nests ; the same ingenuity in their formation is not observable, still they take the precaution, to construct their nests of such materials as assimilate in colour with the objects immediately surrounding them, on which account they are the less liable to attract attention. They feed on seeds, berries, and insects ; seven species are natives of this country, see *British Ornithology*, vols. 1, 2.

6. *Curvirostra*. CROSSBILL. *Bill* as in the last genus, excepting that the *mandibles cross* each other at the tips ; *tongue* entire ; *feet* as in the preceding genus.

The species contained in this genus, have been removed from the GROSBEAKS with which they were associated, on account of the differences above enumerated ; the only two recorded species, have been met with in this country, the *C. vulgaris*, is a frequent visitor, and often commits considerable depredations in our apple orchards. See *British Ornithology*, vol. 1. They feed on seeds, berries, and insects.

7. *Emberiza*. BUNTING. *Bill* strong, conical, the edges of both mandibles curving inwards ; the roof of the upper mandible furnished with a *hard protuberance* or *knob* ; *feet* and *toes* as in the last genus.

The Buntings are numerous and widely dispersed, from the cold and inhospitable shores of Iceland and Greenland, to the hottest parts of Africa and South America. They usually feed on seeds and berries ; the knob in the roof of the upper mandible greatly facilitates their breaking the stones or shells, to get at the kernels. The usually frequent plantations of low underwood ; some, reedy spots on the banks of rivers, and lakes ; others, open campaign countries, particularly such as are in a state of cultivation. Eight or nine species have been observed in this country, see *British Ornithology*, vols. 1, 3.

8. *Tanagra*. TANAGER. *Bill* conical, pointed, notched

near the tip, triangular at the base, and somewhat inclining downwards at the point ; *feet* as in the last.

The whole of this genus are confined to Asia, Africa, and America, many of them are splendidly coloured, and form very elegant pendent nests. They mostly resort to woods and their vicinities ; and feed on seeds, fruit, and insects.

9. *Fringilla*. FINCH. *Bill* strait, conical, sharp-pointed ; *tongue* truncated ; *toes* and *feet* as the last.

The Finches are a numerous family, extending over most parts of the known world, from Lapland and the snowy mountains of Siberia, to the burning climes of Terra del Feugo, and Borneo,—they are mostly insectivorous, some are destructive to pulpy fruits, as Currants, Raspberries, Strawberries and the like, and others feed on seeds and grain ; they generally frequent low bushes, hedges, and the European kinds resort to gardens and orchards. We have nine species common to Great Britain, some of which are kept in confinement, partly from their elegance of plumage, and also on account of their notes. See *British Ornithology*, vols. 1, 2, 3.

10. *Phytotoma*. PLANT-CUTTER. *Bill* conical, strait serrated on the edges ; *nostrils* ovate ; *tongue* short, obtuse ; *toes* three forward and one backward. Of the two known species of the genus ; one, has (in the ninth volume of Shaw's Zoology,) been separated, to form a distinct genus, under the name of *Ilyreus* ; it differs from the *Phytotoma*, in having but two toes forward,

and one backward. In genera containing so few species, and with characters so decided, this seems an unnecessary incumbrance to the system, as though in addition to the above difference of structure, it is said to feed on the seeds and kernels of plants, and the **PLANT-CUTTER**, on the base of the stems, this makes no good reason for separating species so nearly allied, into distinct genera.

Both species are found in South America ; the (*P. rara*), Plant-Cutter, is a very mischievous species, committing great depredations in gardens and plantations, by cutting down the vegetables with its serrated bill ; it feeds principally on the softer parts of the stems and the crown of the roots : the other species, *T. trydactilla*, on seeds and berries.

11. *Muscicapa*. **FLY-CATCHER**. Bill soft, beset with bristles, the upper mandible flattened at the base, and notched near the tip ; *toes* divided to their base.

The extensive genus of Fly-Catchers, (as their name imports,) feed on flies and other winged insects ; they mostly inhabit woody places, and usually nestle in holes ; the larger number are natives of the warmer parts of Asia, Africa, and America ; there are but few that reside in Europe, and only two that repair to this country, they are both migratory, arriving in spring and leaving on the approach of winter, for figures, see *British Ornithology*, vol. 2.

12. *Alauda*. **LARK**. Bill slender, strait, pointed, curving slightly at the tip : *nostrils* covered with feathers and

bristles; *tongue* cleft; *toes* divided to their origin; *claws* sharp, those on the hind toes very long, and nearly strait; *feet* formed for running.

This genus, though not so numerous as some others, is dispersed over most parts of the known world, many of the kinds possess a fine note; their colours are of rather a sombre cast, partaking principally of various shades of brown and olive; they feed on seeds, insects, and worms, some are only to be found on the sea shores, others in retired woods, but the greater part frequent open cultivated countries; they generally build on the ground; their motions on foot is by running and walking; not any of the species hop. See *British Ornithology*, vols. 1, and 2.

13. *Motacilla*. WAGTAIL. *Bill* slender, very soft, slightly notched near the tip; *tongue* fringed at the point; *toes* three forward and one backward, the *middle toe* connected to the outer one as far as the first joint; *hind-toe* and *claw* very long: *feet* as in the last genus: *tail* long.

This is a lively active tribe, of familiar habits, and great elegance of form; the species are not numerous; and are principally confined to Europe, Asia, and Africa: they mostly resort to the sides of ponds and running streams; and feed on insects and worms; they run on the ground in the manner of the Lark genus, and derive their name from the continued motion of the tails. Three species are natives of Britain, see *British Ornithology*, vol. 1, 2, 3.

14. *Sylvia*. WARBLER. *Bill* slender, weak ; *nostrils* small ; *toes* as in the last genus, excepting that the *membrane* connecting the centre and outer toes, merely connects them on the *under side* ; *feet* formed for hopping and perching.

Many species of this very extensive family possess exquisitely fine notes, a great degree of elegance in their plumage, and manners, lively and familiar ; some affect woody solitary places, others, are constant attendants on the industry of Man ; their food is insects, worms, seeds, fruit and grain : almost every known country possesses some species, either peculiar to itself, or in common with other places, under the same latitude ; their nests are generally formed of soft downy materials, and placed either in holes in trees, walls or banks ; in bushes, or in branches of trees ; some construct pensile nests, others sew the edges of leaves together with dry fibres, and form a purse, which they line with down, as the Taylor Warbler. A few of the species build on the ground, under a tuft of grass, or beneath a stone ; and a large number of them practise much artifice to allure any intruder from their nests. They may often be taken, either in common Nightingale traps, baited with a live worm, or in clap nets. Twenty species occasionally repair to this country. See *British Ornithology*, vols. 1, 2, 3.

15. *Pipra*. MANAKIN. *Bill* shorter than the head ; strong, hard, inclined to triangular at the base, and slightly incurvated at the tip ; *nostrils* naked ; *feet* formed for walking and perching ; *tail* short.

This genus is principally confined to South America, India, Cape of Good Hope, and the West India Islands; most kinds are of gay plumage, their habits very wild and shy, feeding on fruits and insects; and frequenting woody situations.

16. *Hirundo*. SWALLOW. *Bill* short, weak, broad, flattened at the base, curving at the tip; *gape* wide; *nostrils* open; *tongue* broad, short, bifid; *tail* forked; *toes* three forward, one backward; a few species have the *four toes*, all placed forwards, (as in the British species, the Swift. *H. apus*.)

A lively, active, cleanly family; generally frequenting the vicinity of water, they are mostly migratory, the European species repairing northwards in Spring, and southward in Autumn. They are entirely insectivorous, and take their prey generally on wing; their nests are composed of tempered earth, mixed with straw, and lined with feathers. They may be obtained either by the gun, or in a net placed across any avenue they frequent, which should be drawn up the instant they are approaching, as they fly with so much velocity, as to prevent their escaping, if the net be managed with any degree of adroitness. Four species, are natives of this country. see *British Ornithology*, vol. 1.

17. *Glareola*. PRATINCOLE. *Bill* short, strait, hooked at the tip; *gape* wide; *nostrils* placed near the base, linear, oblique; *toes* long, slender, connected by a membrane at the base; *legs* bare of *feathers* above the *knees*; *tail* forked, composed of twelve feathers.

This genus has been usually classed with the water-birds ; we have removed into what we consider its more natural situation ; as in habits, propensities, and exterior structure, it greatly resembles the last genus. Like the Swallows, these birds take their food on wing, there are but three known species, one only of which has been found, and that but very rarely in this country, they resort to the sides of lakes and rivers, and feed entirely on insects. See *British Ornithology*, vol. 2.

18. *Caprimulgus*. GOATSUCKER or NIGHT HAWK. *Bill* short, broad hooked at the tip, the upper mandible furnished with a row of *stiff bristles* along the edges ; *gape* very wide, extending backward beyond the eyes ; *tongue* pointed, entire ; *legs* short and scaly ; *toes* connected by a membrane as far as the first joint ; *middle claw* serrated ; *tail* composed of twelve feathers.

All this family are nocturnal birds, and like the Owls, seldom quitting their retreats during the day ; but on the approach of night, they come from their hiding places in search of food, which consists entirely of beetles, moths, and other winged insects, which they take on wing, like the two preceeding genera. They are not a numerous tribe, but are dispersed over Africa, America, and the East and West Indies, only one species is found in Europe, and that is common to this country. During the day, these birds retire to woods, and roost among the branches, placing themselves lengthways along a branch, in which position they are less likely to attract notice : when on wing, their flight is so silent, that though numbers may be flitting around

within a few yards, yet no noise is perceptible ; they deposit their eggs, (two in number,) on the bare ground, without any nest. We have known them taken by suspending a beetle on a hook attached to a fishing line, across the branch of a tree ; but the most certain mode of procuring them, is by the gun. For figure of *C. Europeus*, the Common Goatsucker, see *British Ornithology*, vol. 2.

ORDER IV.

COLUMBINE.

Of this Order, there is only one genus, that of the DOVE or PIGEON, which is numerous, and dispersed over the greater part of the known world ; the whole tribe are endowed with vast power of wing ; they usually live in pairs, are gregarious, and constantly lay but two eggs at a sitting, which invariably produces a male and female ; their flesh is eaten, and considered as nutritious to man ; they breed many times in the year, are long lived, and feed on grain, pulse, and other vegetable substances.

Columba. DOVE or PIGEON. *Bill* weak, conical, pointed ; *nostrils* oval, placed in a *soft protuberance* that covers the base of the bill ; *tongue* entire ; *toes* divided to their origin ; *feet* formed for walking.

Three species are common to England, see *British Ornithology*, vol. 2.

ORDER V.

GALLINÆ.

Gallinaceous Birds contribute more than any others, to the comforts of Mankind; the family is not numerous, but it is very generally dispersed, some or other of the species, being natives of almost every known country. Their flesh is delicate and nutritious, their increase great, particularly of those kinds that have been domesticated; some species nestle on the ground, their nests are carelessly formed, frequently being nothing more than a slight excavation in the ground, only sufficiently deep to prevent the eggs from rolling out; others roost and build in trees, but the nests of all are of a very loose texture: their young run about and search for food as soon as excluded from the shell, and frequently with parts of it adhering to them. Some of the species are monogamous, others polygamous; and they are all short lived compared with most other tribes.

The Gallinæ are distinguishable from the other orders, by their robust form, short wings; and their legs being generally armed with spurs; they feed on grain, seeds, vegetables, insects and worms; the order contains ten genera.

1. *Pavo*. PEACOCK. *Bill* convex, strong; *head* covered with *revolute feathers*; *nostrils* large; *tail feathers* very long, capable of being erected, depressed, or expanded at pleasure; the tip of each tail feather dilated and ornamented with an *eye-like spot*.

This most splendid genus inhabits the interior of India, Japan, and the Islands in the Indian Ocean; they are generally domesticated; but in their wild state are shy, and rarely to be obtained but by the gun.

2. *Meleagris*. TURKEY. *Bill* conical, strong, incurvated; head covered with bare *carunculated* or *tuberculated* skin; chin in the male furnished with a longitudinal membranous caruncle; *tail* broad, expansive; *legs* spurred.

This genus, of which but two or three species are known, inhabits America, and India; the common Turkey, (*M. Gallopavo*,) is generally domesticated; in its native state it is gregarious, and principally resorts to low woods; is a shy bird, very swift on foot, and but rarely taking wing; the other kinds are but little known.

3. *Numidia*. PINTADO or GUINEA-FOWL. *Bill* short, strong, the base covered with a carunculated cere, in which are situated the nostrils; a compressed varigated *Callous* or *Horn* extends from the base of the bill to the top of the forehead; *tail* short, depressed.

All the Pintados are natives of Africa, but like the preceding genera, some of the species are domesticated, the common Pintado (*N. Meleagris*,) is commonly so through most parts of Europe. When wild they are gregarious, and inhabit woody places, roosting mostly on the tops of the highest trees, they are exceedingly shy, and are scarcely to be procured but by the gun.

4. *Crax*. CURASSOW. *Bill* strong, thick, the base of the mandibles covered with cere; *nostrils* situated in the cere; *feathers* on the head long, with recurvate tips, forming an elegant crest; *tail* large, strait, expansile.

The Curassows are principally natives of South America, are very shy, run with great swiftness, and fly better than most birds of equal bulk, they inhabit mountainous woody districts; and are sometimes taken by steeping grain in spirituous liquor, and placing it in situations where these birds resort; on devouring the grain thus prepared, they become stupified, and may then be easily taken; this plan will be found to answer for the capturing of most of the birds of this order.

5. *Phasianus*. PHEASANT. *Bill* short, strong, curving at the tip; the edges of the upper mandible projecting over the lower one; *nostrils* covered with a *bare granulated skin*; *legs* strong, furnished with a *spur* on the inner side.

Most species of this genus are natives of India, and the adjacent Islands, and are all of splendid plumage; some of the kinds are domesticated, and the common Fowl, (*P. Gallus*), is rarely met with but in a domesticated state; it is originally a native of the East, but is now generally dispersed throughout most civilized countries, it is subject to numerous varieties, in colour, texture and disposition of its feathers. The other species are mostly shy, and resort to the jungles and forests of India, they feed almost exclusively on grain; the flesh of all the kinds is in high esteem as food. They

may be taken either by the mode mentioned for the capture of the last genus, or the gun.

6. *Penelope*. TINNAMOU. *Bill* naked at the base; *head* thickly covered with feathers; *chin* and *throat* naked; *legs* without spurs.

This is of very similar habits with the last genus, and the species are natives of South America, and Africa.

7. *Tetrao*. GROUS. *Bill* short, strong; *nostrils* covered with feathers; *skin* over the eyes bare; *tongue* entire, pointed; *legs* and *toes* feathered; *claws* concave.

This genus is principally confined to the colder regions of Europe, Asia, and America, they are all thickly covered with feathers, which enables them to sustain the cold of the most severe climates; the flesh of all the kinds is highly esteemed; they mostly affect woody and mountainous situations, and feed on berries, the young shoots of heath, and also on pine leaves: they nestle on the ground, and most of the kinds are polygamous. Four species are natives of Britain. See *British Ornithology*, vol. 1, 2.

8. *Perdix*. PARTRIDGE. *Bill* strong, short; *nostrils* covered with a bare prominent rim; *eyes* (in some species,) surrounded with a bare warty skin; *legs* naked; *tail* short.

This genus is divided into Partridges, which have their legs furnished with a blunt spur; and Quails, which are

without spurs. This family is dispersed over most parts of the globe ; the species are numerous, and the flesh of all is exceedingly delicate : they feed principally on grain ; all of them nestle on the ground, their young run as soon as excluded, often with the shell adhering. They fly heavily, but run exceedingly swift ; may be taken by means of a net drawn over the places they frequent, as instead of taking wing, they mostly, on being surprised, instantly squat on the ground. Three species are natives of this country, see *British Ornithology*, vol. 1, 2, 3.

9. *Psophia*. TRUMPETER. *Bill* conical, convex, pointed, the upper mandible largest ; *nostrils* oval, pervious ; *tongue* cartilaginous, flat, fringed at the tip ; *feet* four toed.

This genus is confined to Africa, and South America ; the species are frequently tamed ; their flesh is used as food ; and they affect mountainous situations.

10. *Otis*. BUSTARD. *Bill* nearly conical, very strong, blunt pointed ; *nostrils* oval, pervious ; *tongue* bifid, pointed ; *legs* longish, bare above the *knees* ; *feet* three toed.

The Bustards are natives of Europe, Asia, and Africa ; they are all exceedingly swift on foot, but fly heavily ; they frequent open campaign countries ; feed on grain, vegetables, and worms. Their flesh is in high esteem as food ; are so very shy, as to be rarely obtained but by the gun.

The males of this genus are furnished with a jugular pouch,

capable of containing water, which these animals are enabled to convey to their young, in the extensive plains to which they resort. Two species are natives of Britain.

ORDER VI.

STRUTHIONES.—*STRUTHIOUS*.

The Birds of this Order are distinguishable from the preceding, by their being destitute of the power of flying; the great bulk of their bodies, conjoined to the shortness, and in one instance total absence of wings, effectually prevents their raising themselves from off the ground; to counterbalance this seeming defect, they possess greater swiftness of foot than any other known Animals; insomuch that some of the species will outrun the swiftest coursers.

Their internal structure differs greatly from all the other families of Birds, as well as from each other. The OSTRICH possesses the usual *intestines* accompanying Graminivorous Birds; and also a *gizzard*, capable of resisting the action of the hardest substances, and the power of rejecting such substances, without injury to the internal parts. The CASSOWARY has *intestines* of a similar structure with those of Carnivorous Birds, likewise a *gizzard* as in the Ostrich. In their wild state they affect open countries, and feed on vegetable substances, worms, and small reptiles; they are all very shy and so exceedingly swift, that unless captured when quite young, they are rarely to be obtained but by the gun. The Order consists of three genera.

The characters of which, are strong muscular *bodies* ; *wings* short ; *legs* long, stout, and scaly ; *toes* two or three ; *tail* very short or wanting.

1. *Didus*. DODO. *Bill* narrowed in the middle, with two transverse wrinkles, each mandible bent in at the tip ; *nostrils* oblique, situated near the middle of the bill ; *face* naked beyond the eyes ; *legs* short and thick ; *feet* cleft ; *wings* short ; *tail* wanting.

This is a genus, of which but very little is known, they are said to inhabit the Isles of France, Bourbon, and Madagascar, and to be exceedingly swift and shy.

2. *Struthio*. OSTRICH. *Bill* subconical ; *tongue* short, flat, entire ; *nostrils* oval ; *wings* short ; *feet* two or three toed.

Ostriches are confined to the extensive plains in the interior of Asia and Africa, and are so exceedingly swift of foot, as almost to defy pursuit ; the tail feathers are in considerable demand, as articles of ornament, on which account the birds are much sought after, but they are, when full grown, with great difficulty obtained alive. They feed on vegetables and worms, and in confinement, will swallow almost every substance that offers, provided the size be not too large, such as stones, glass, wood, metals, &c. They lay a vast number of eggs, and according to Le Vaillant and others, the female lays a number of barren eggs, near the spot where the perfect ones are deposited ; and which form a store of food for the young, as soon hatched. In the hotter parts, the Ostrich

leaves its eggs to be hatched by the heat of the sun, but in the more temperate regions, the females perform the office of incubation during the night. The eggs, as also the flesh of the young Birds, are considered delicate food, but the flesh of the adults is hard, dry, and insipid.

3. *Cassuarius*. CASSOWARY. *Bill* subconical; *gape* large; *nostrils* placed near the top of the bill, from the base of which rises a *horny protuberance*; *tongue* very small; *neck* covered with *carunculated protuberances*; *tail* and *wings* wanting; in lieu of which a number of bare *shafts* without any *plume*, project from the shoulder bones; *feet* three toed.

This in general habits resembles the last genus, and are likewise natives of the same countries; they are very shy, exceedingly gluttonous, and their flesh is of so coarse a kind as to be generally rejected.

DIVISION II. *WADERS*.

ORDER VII.

G R A L L Æ.

CLOVEN-FOOTED WATER-BIRDS.

The individuals of this class are very numerous, and widely dispersed, differing greatly in interior and exterior conformation, but agreeing in this one particular, that they are invariably bare of feathers, to mid-way above the knees,

by which peculiarity of structure, they can without inconvenience wade in shallow water in search of food, which for the most part consists of small Aquatic Animals, Roots, and Seeds; most of the kinds are of a shy nature, and shun the habitations of Man; they usually nestle on the ground, though this is not constant even in the same genus: the genera *Scolopax*, *Tringa*, and *Charadrius*, all lay on the ground, and their eggs, (four in number,) are constantly placed with their smaller ends to the centre, by which disposition they occupy the least possible space.

The flesh of such kinds as feed on insects and worms, is accounted excellent food; but that of the piscivorous kinds is rank, and is generally rejected. There are eighteen genera in the order, the only character they possess in common, is their half-naked thighs.

1. *Platalea*. SPOON-BILL. *Bill* long, broad, flat, thin, and at the extremity, widened into a roundish form, not unlike a spoon; *nostrils* small, placed near the base of the bill; *tongue* small, pointed; *toes* four, semipalmated.

This curious genus is not numerous, the species are dispersed through Europe, Asia, Africa, and America: they feed on frogs and other reptiles, also on aquatic plants. The common Spoon-bill, (*P. Leucorodix*,) which is sometimes met with in this country, builds its nest in lofty trees, and is mostly found by the sides of rivers, or on the sea-shore, its eggs and young are esteemed as food. *British Ornithology*, vol. 2.

2. *Palamedia*. SCREAMER. *Bill* conical, the upper mandible hooked; *nostrils* small, oval; *toes* slightly connected at their bases.

Only two species are known, the Horned Screamer *P. Cornuta*, and the Crested Screamer, *P. Cristata*, they are both natives of South America, and feed like the last genus; the young and eggs are sometimes eaten: their places of resort are principally in the vicinity of extensive swamps.

3. *Mycteria*. JABIRU. *Bill* long, sharp pointed, inclining upwards at the tip, upper mandible triangular; *front* of the *head* bare of feathers; *nostrils* linear; *tongue* small; *feet* as in the last genus.

The Jabirus are natives of India, South America, and New Holland, they feed principally on fish, in default of which, small animals and even carrion are greedily devoured. Their flesh is not applied for the purposes of food: they frequent marshy places, and the banks of rivers and lakes.

4. *Cancroma*. BOAT-BILL. *Bill* gibbous, shaped like an inverted boat; *nostrils* small, placed in a furrow; *tongue* small; *feet* four toed, all separate.

This genus is confined to South America, is of a dull heavy disposition; they frequent woody situations on the margins of rivers, or in the vicinity of the sea; build in trees, and feed on fish, reptiles, and crabs.

5. *Scopus*. UMBRE. *Bill* long, thick, slightly compressed and hooked; *nostrils* linear, oblique; *feet* as in the last genus.
6. *Ardea*. HERON. *Bill* strait, compressed, sharp pointed; *nostrils* linear, situated in a furrow that extends from the base nearly to the tip of the bill; *tongue* pointed; *toes* four, the three front ones connected by a membrane as far as the first joint. This very extensive genus is separated into five families. CROWNED CRANES, *bill* not exceeding the head in *length*, head with a permanent *crest*. CRANES, *head bare of feathers*. STORKS, the *eyes* surrounded by a *bare granulated skin*. HERONS, the *centre claw* serrated: these are again divided into two classes; the first contains such species as have strait cultrated *bill*, even and closing at the edges; the second, those that have their *bills* *gaping* in the centre. BITTERNS, these only differ from Herons in having the *long feathers* on the breast *adpressed*, (whereas in the Herons they are quite loose, and incline forward;) and the *feathers* on the *crown* and *sides* of the head erectable at pleasure.

This genus is dispersed over most parts of the known world; the species differ greatly in size, but agree in their general habits and æconomy; they feed on fish, reptiles, snakes, small quadrupeds, insects, worms, and the seeds and roots of aquatic plants. Some of the species build on the ground, others in lofty trees, and one or two attach themselves to the dwellings of man. They are mostly a shy, and very wily class, frequenting wild uncultivated marshy places,

exceedingly destructive in fish-preserves, and with difficulty obtained but by the gun. Twelve or more species have been occasionally found in Great Britain. See *British Ornithology*, vols. 1, 2, 3.

7. *Tantalus*. IBIS. *Bill* long, subulate, roundish, curving towards the point; *skin* in front of the eyes *bare*; *tongue* short, broad; *nostrils* oval; *toes* palmated at the base.

In general habits, nearly approaching the last genus; some of the kinds are held sacred, from their devouring great numbers of noxious reptiles.

8. *Numenius*. CURLEW. *Bill* long, curved; *nostrils* linear; *tongue* short, pointed; *toes* connected as far as the first joint by a strong membrane.

These frequent the shores of the sea, rivers, and the margins of lakes, and feed on small fish, aquatic worms, insects, and plants; they nestle on the ground, and the young run as soon as excluded from the shell. Three species are natives of Great Britain. *British Ornithology*, vol. 1, 3.

9. *Scolopax*. SNIFE. *Bill* strait, long, slender, the upper mandible extending somewhat beyond the lower; *nostrils* linear, situated in a furrow; *tongue* pointed; *toes* in some species connected as in the last genus, in other species all separate; hind-toe very small.

This family are all very shy, swift on-wing, and shun the

habitations of Man ; some of the species are only found on the shores of the ocean, others frequent woody situations abounding with springs, or small rivulets, and most kinds are found in extensive marshes, or fens ; they feed principally on worms and insects, and their flesh is in considerable esteem as food. They may be caught in springes made of strong horse hair, or fine cat-gut, which should be placed beside plashy springs, particularly on the borders of woods, situated near extensive waters. A considerable number of species and varieties, are found in Great Britain, and the adjacent isles, *British Ornithology*, vol. 1, 2, 3.

10. *Tringa*. SANDRIPER. *Bill* strait, slender, not exceeding an inch and a half in length ; *nostrils*, small, linear ; *tongue* slender ; *feet* and *toes* as in the last genus.

Nearly resembling the preceding, in habits, æconomy, food, and places of resort ; the flesh of all are applicable to the purposes of food.

11. *Charadrius*. PLOVER. *Bill* strait, round, somewhat enlarged at the tip ; *nostrils* linear ; *feet* formed for running, having three toes, all placed forwards.

This greatly resembles the two preceding families ; in general character, but affects rather dryer and often mountainous situations ; the three genera, as we have before observed, always lay but four eggs, which they deposit on the ground without any nest, in some slight excavation, with their smallest ends placed towards the centre, as in this

position, the bird is able to cover them more effectually, whilst incubating. The flesh of all is excellent.

2. *Cusorius*. COURSER. *Bill* round, incurvated near the tip, pointed; *gape* large; *tongue* sharp: *nostrils* ovate; *feet* and *toes* as in the last genus; with which it agrees in habits, &c., and has only recently been separated from that genus, on account of the difference in the structure of their *bills*.

The only species has been occasionally found in this country.

13. *Hæmatopus*. OYSTER-CATCHER. *Bill* long, compressed, wedge-shaped at the tip; *nostrils* linear; *tongue* triangular, about one third the length of the bill; *feet* three toed; the outer toe connected by a membrane to the middle one, as far as the first joint.

Frequents the sea-shores, and salt-water inlets, feeds on shell fish, particularly limpets, which it detaches from stones by insinuating its wedge-like bill under the edges of the shell, or by a sudden blow with its bill, which often perforates the shell, and it then devours the animal at its leisure; it derives its name of Oyster-catcher, from its devouring those in common with most other kinds of bivalve testaceous animals; the instant it perceives the Oyster opening its shell, it thrusts in its bill (the point of which is hard and very sharp,) and draws out the animal. There is one native species, *British Ornithology*, vol. 1.

14. *Rallus*. RAIL. Bill long, slender, slightly compressed and incurvated; *nostrils* small, pervious; *tongue* rough at the tip; *body* compressed; *tail* short; *toes* four, divided to their base; *feet* formed for running.

These are all shy birds, and mostly frequents the sides of small pools, they secret themselves amongst high grass or herbage during the day; and feed generally at dusk or evening, or before sun-rise; they feed on worms, insects, seeds, and vegetables. The flesh of all the kinds is accounted excellent food. Only one species is found in Great Britain. *British Ornithology*, vol. 1.

15. *Parra*. JACANA. Bill cylindrical, point obtuse; *nostrils* oval, situated in the middle of the bill; front of the bill covered with lobate *caruncles*; *wings* armed with strong spurs or spines; in several of the species the *hind claws* are exceedingly long.

The Jacanas inhabit the sides of rivers, lakes, and extensive swamps, in Africa, South America, and the adjacent islands, they feed on worms, insects, and small aquatic animals; they mostly breed on the ground; and their flesh is considered as fit for food; one species is domesticated.

16. *Gallinula*. GALLINULE OR WATER-HEN. Bill compressed, thick at the base, from whence a bare skin or *callos*, extends up the forehead; *nostrils* oblong; *wings* and *tail* short; *legs* compressed sideways; *toes* four, long, divided to their origin, and furnished with a narrow serrated edgeing.

This family are sub-aquatics, and are but rarely found at any considerable distance from water; they swim and dive admirably, and for the most part procure their food in the water; which consists of small fish, aquatic insects, and worms; they also devour grain, and our indigenous species will often after harvest, quit their watery retreats, and repare to stubble lands, when their flesh is good tasted; but at other times it is usually rank and fishy: they mostly build either a floating nest, or nestle on the ground; their young either run as soon as hatched, or take to the water, in the latter they may be often seen with parts of the shell sticking to them.

The LAND RAIL, or CRAKE GALLINULE, (*G. Crex*,) as also the SPOTTED WATER RAIL, (*G. Porzana*,) belong to this genus, though originally classed by Linnæus with the genus *Rallus*. Five species are enumerated as British. *British Ornithology*, vol. 2.

18. *Vaginalis*. SHEATH-BILL. *Bill* strong, thick, conic-convex, compressed, the upper mandible covered on the top with a moveable *horny sheath*; *nostrils* small, placed before the sheath; *tongue* above, round, beneath, flattened, pointed; *face* naked, papillous; *wings* with an obtuse *excrescence* under the flexure; *legs* strong, four toed, *toes* rough, beneath; *claws* grooved.

This genus, of which only one species has been discovered, inhabits New Zealand, is said to feed on shell fish, and carcasses.

DIVISION III. *WATER BIRDS.*

ORDER VIII.

PINNATIPEDES.

WATER BIRDS, WITH PINNATED FEET.

The Birds comprised in this Order, are all furnished with membranous edgings to their feet, they swim and dive well, mostly inhabit either the shores of the sea or salt-water inlets, and feed on fish, and marine animals. The Phalaropes, generally deposit their eggs amongst shingle, on the beach; the other two genera mostly build floating nests, which they secure by interweaving a part of some living plant, when composing their nests, which prevents the them being carried away by the current; the flesh of all the kinds is rank and fishey, and though sometimes eaten, is scarcely a remove from carrion. There are three genera in the order.

1. *Phalaropus*. PHALAROPE. *Bill* strait, slender; *nostrils* minute; *legs* very slender; *toes* edged with a broad and deeply scalloped membrane, which is serrated at the edges.

In habits, &c., this nearly resembles the Sand-piper genus; they are natives of very cold countries, and frequent only the shores of the ocean, their food is marine worms, and insects.

2. *Fulica*. COOT. *Bill* short, strong, the upper mandible having at its base a bare callous, extending up the forehead ; *nostrils* pervious, long, narrow ; *toes* four, surrounded by a scalloped membrane, which is entire at the edges ; *tail* short.

The Coots generally inhabit large lakes, and inlets from the sea, they build floating nests, swim and dive well, but walk very awkwardly ; they feed on fish, worms, insects, and in the autumnal months, often repair to corn-fields, and devour grain ; and except at this season their flesh is unfit for food. One species is a native of the British Islands. *British Ornithology*, vol. 1.

3. *Podiceps*. GREBE. *Bill* strong, strait, pointed ; *nostrils* linear ; *tongue* slightly cleft ; *skin* surrounding the eyes, bare ; *legs* placed far behind, compressed sideways, the hind part edged with a double row of serratures ; *toes* surrounded with a plain membrane ; *tail* wanting.

Most of the Grebes inhabit the sea or mouths of large rivers, but in the Spring, retire to inland lakes to breed, and rear their young ; they are all piscivorous, and their flesh unfit for the purpose of food ; their motions on land are awkward, owing to the situation of their feet, which seem to protrude from the extremity of their bodies : in the water, they are exceedingly active ; they build floating nests, and on quitting them cover their eggs with any decaying vegetables they can obtain, which effectually screen them from observation ; their nests are composed of so large a quan-

tity of leaves, &c., that some Naturalists have been induced to believe that these birds do not incubate, but that their eggs are hatched by the heat engendered by putrefaction; the young take to the water as soon as excluded from the shell. Several species are natives of Great Britain. *British Ornithology*, vols. 1, 3.

ORDER IX.

PALMAPEDES. WEB-FOOTED.

This order of Birds is conspicuously distinguished from all the preceding, by having the *three front toes* in all; and in some genera, the *four toes united* by a *membrane*, from which circumstance it derives its name of WEB-FOOTED.

Of the various genera composing this numerous family, most kinds feed on fish, worms, insects, and rejectamenta of the sea and rivers; they all reside on the shores of the ocean, or in the vicinity of large rivers and lakes; but very few at present will class among the positively useful, as far as regards Man; the Duck tribe alone has been selected for domestication, and which now greatly contributes to the comforts and luxuries of civilized life; their flesh and eggs serving as food, and their feathers and down also contribute to the conveniences of Mankind. Excepting the extensive genus of Ducks, the flesh of most kinds is rank, fishy, and unfit as food for man, some of the kinds build on the ground, others deposit their eggs without any kind of nest, in holes in the earth; a few dig deep burrows in the banks of the

sea, or salt-water inlets, and deposit their eggs at the extremity ; and some lay on ridges of rocks overhanging the sea ; the eggs of most kinds are strong and rank tasted ; but are often eaten ; as likewise the young of several species. The order contains seventeen genera.

1. *Recurvirostra*. AVOCET. *Bill* long, slender, curving upwards, and tapering to the tip ; *nostrils* narrow, pervious ; *tongue* short, entire ; *legs* long ; *feet* palmated, with the *webs* deeply indented between the toes ; *hind toe* small, separate.

This very curious genus resides in the vicinity of the sea, or on the banks of large rivers, feeds on aquatic worms and insects ; does not swim, but if by accident they get into deep water, they float with the current, without any exertion to extricate themselves ; their eggs are considered as delicacies, and the flesh of the young bird has the preference over most of its congeners. *British Ornithology*, vol. 1.

2. *Corrira*. COURIER. *Bill* short, strait, entire ; *legs* and *thighs* long ; three *front toes* webbed, *hind toe* small, distinct.

The only species of this genus inhabits Italy, and the South of Europe ; runs swiftly, and in manners assimilates with the preceding genus.

3. *Phaenicopteros*. FLAMINGO. *Bill* bare at the base, toothed, bent in the middle as if broken ; *nostrils* linear,

feet palmated, the membrane deeply indented ; *hind toe* not connected.

These Birds are gregarious, being generally found in very considerable numbers ; they feed on fish, and aquatic insects ; the flesh of the young birds and the eggs are accounted good ; they build their nests in shallow pools, composing them of a large quantity of decaying vegetables and sticks, these are piled up so high, that the birds sit on the eggs with their feet hanging over the sides of the nest. They are natives of Africa, and South America ; are rather a stupid race, as they do not use the powers they are possessed of, either to avert or resist attacks.

4. *Diomedea*. ALBATROSS, or MAN-OF-WAR BIRD. *Bill* straight, upper mandible hooked at the point, lower one truncate ; *nostrils* prominent, oval, lateral, pervious ; *tongue* very small ; *feet* palmated ; *toes* four, all placed forwards.

This genus inhabits isolated rocks, situated in the ocean ; they are gregarious, feed on fish and moluscæ ; their flesh is rank, and unfit for food.

5. *Alca*. PUFFIN or AWK. *Bill* strong, thick, compressed, furrowed ; *nostrils* linear, placed in a furrow, near the edge of the mandible ; *tongue* nearly the length of the bill ; *toes* three, palmated.

The Awks are all oceanic birds ; they feed on fish, and moluscæ, and lay only one egg, either in burrows,

or in the clefts of rocks; the eggs and young are occasionally eaten. One species, (*A. Impennis*) the Great Awk, is almost destitute of wings, and is unable to fly; four species frequent our shores. *British Ornithology*, vol. 1, 2.

6. *Uria*. GUILLEMOT. *Bill* slender, very sharp-pointed, edges cultrated; the upper mandible slightly curving towards the tip; *base* of the bill covered with short downy feathers; *nostrils* linear, placed in a furrow near the base; *tongue* slender, almost the length of the bill; *feet* three toed, palmated.

This genus agrees in most particulars with the preceding, they lay but one egg, in similar situations with the Awks.

7. *Colymbus*. DIVER. *Bill* strong, strait, pointed, edges of both mandibles inclined inwards, the upper mandible somewhat projecting; *nostrils* linear; *tongue* long, pointed, serrated on the sides near the root; *legs* thin, compressed sideways; *toes* four, the outer one longest, palmated; the *hind toe* connected to the inner one by a small membrane; *tail* short, composed of twenty or more feathers.

The Divers are generally confined to the Arctic circle, except during extreme frosts, when they frequent the northernmost shores of Europe and America; they feed on fish and other marine productions; five species have been met with in the British Islands.

8. *Rynchops*. SKIMMER. *Bill* strait, the upper mandible much the shortest, the lower one truncate at the tip ; *feet* palmated.

Natives of America and Asia ; feeding on fish, which they scoop out of the water whilst skimming over.

9. *Sterna*. TERN or SEA-SWALLOW. *Bill* strait, slender, sharp-pointed ; *nostrils* linear ; *tongue* sharp, slender ; *wings* very long ; *tail* forked ; *feet* small, webbed, *hind toe* small, distinct.

Terns are abundant on most bold and rocky shores, they are a noisy restless tribe, at constant war with the lesser kinds of their own genus, as also with the smaller Gulls, from which propensity they have acquired the name of Gull-Teazer : these are pursued for the purpose of making them disgorge their food, which is seized by the Tern before it reaches the water ; they also devour fish, and any animal matter they may find on the surface or margins of the sea. All the species are exceedingly shy ; they lay their eggs among shingle, on the sea shore, as also on the banks of salt-water lakes or marshes. They are rarely obtained but by the gun. Several species are found in England and the adjacent Islands. *British Ornithology*, vols. 2, 3. The collector will find it to his advantage to procure this family at different periods of age, as most, if not all the kinds, do not attain their full plumage till the third or fourth year.

10. *Larus*. GULL. *Bill* strong, strait, but inclining downwards at the point, the lower mandible furnished with

an *angular prominence* ; *nostrils* oblong, narrow, situated in the middle of the bill ; *tongue* slightly cleft ; *wings* long ; *legs* and *feet* small ; *front toes* palmated, *hind toe* small, distinct.

This is a very numerous class, in the general outline, their habits resemble those of the Crows, like which, they devour carrion, and the most putrid substances, and in default of this kind of food, they prey on small birds ; several kinds repair to arable ground, where they are of considerable service in destroying worms and grubs, they will likewise devour grain and pulse. They all inhabit the shores of the ocean, but are most abundant in the colder regions. Gulls are several years in attaining their full or perfect plumage, and some of the kinds change their colours, on the approach of winter : they easily become tame, and are useful in gardens to destroy worms, slugs, and snails ; they soon become familiar, and may be fed with any kinds of offal. A great variety resort to our shores, see *British Ornithology*, vols. 1, 2.

Some birds at present classed with this genus, (but which possess a character sufficiently decided to form a distinct genera upon,) are furnished with a *cere* at the base of the bill, in which the *nostrils* are situated ; all these are of a fierce and voracious disposition, (approaching to the Falcon tribe,) and often devour the lesser kinds of Gulls, and other birds. These, and the true Gulls, deposit their eggs on heaps of sea weed, placed on shelving rocks, mostly in large communities ; they feed their young with the castings of their stomachs, till able to provide for themselves.

11. *Procellaria*. PETREL. *Bill* strong, strait, bending downwards at the tip; *nostrils* contained in a *tube*; *toes* three, webbed; *legs* furnished with a spur in lieu of a back toe.

The species of this genus pass the principal part of their time on wing, being but very rarely seen near shore, except during the breeding season; they generally frequent cold climates, and feed on the carcasses of whales, and other animals; they possess the power of ejecting a quantity of oil from their bills when alarmed. We are informed the inhabitants of the Western Islands procure *P. Glacialis*, the FULMAR PETREL, and passing wicks of cotton completely through their bodies, use them instead of lamps. All the species are of a very oily nature; and their flesh is rank and offensive in the highest degree.

12. *Mergus*. MERGANSER. *Bill* slender, depressed, both mandibles serrated on the edges, the point of the upper mandible furnished with a *curved nail*; *tongue* serrated on the sides; *nostrils* small, oval, situated near the centre of the bill; three *front toes* palmated, the outer one the longest; the *hind toe* with a fin-like appendage.

All this genus are piscivorous; for the catching and securing their prey, they are furnished with bills toothed on both edges, by means of which they are enabled to secure the most slippery of the finny tribes. They are all of wild, shy, and very retired habits, and their flesh is very bad; so much so, that we have an old proverb, "he who would regale the Devil, might serve him with *Merganser* and *Cormorant*."

The Mergansers form their nests on the ground, which they line with down from their breasts, both sexes contributing towards the composing of the structure ; this down is much sought after by the natives of those countries where these birds resort, and is of equal value with the down of the Eider Duck. Several species migrate to this country during winter. *British Ornithology*, vols. 2, 3.

13. *Anas*. DUCK. Bill broad, depressed, the tip furnished with a *horny appendage* or *nail* ; the *edges* of the *bill* pectinated ; *nostrils* small, oval ; *tongue* broad, fringed near the base ; *front toes* webbed ; *hind one* separate.

This genus is divided into DUCKS, which have their bills *depressed* ; GEESE, having their bills *compressed* ; and SWANS, which are of larger size, having *compressed* bills, generally furnished with a hard *gibbosity* at the base.

Many of this class contribute largely to the support and convenience of mankind. They all reside in the immediate vicinity of water, from whence they derive the principal part of their food ; some are entirely marine, and feed on fish, moluscæ, and shell-fish, the flesh of these is no better than carrion, but their down and feathers are articles of commerce ; other kinds are commonly found in rivers, lakes, and extensive meres, feeding on aquatic insects, small reptiles, worms, seeds and grain, the flesh of these is of good flavour, and is in general request for the purposes of food ; their quills, feathers, and down, are likewise articles of commerce. Numerous species of the latter kinds are kept in a domestic state : they are all very shy, of a suspicious nature, and

much caution is requisite to obtain them when wild ; the practice in general use in this country is to have a large net placed on hoops, over some narrow creek leading from their place of rendezvous, which is mostly some large lake or river, (these are called decoys ; and are often very lucrative,) when the wind blows towards these creeks, (or as they are technically called pipes,) a quantity of seed is scattered on the water, which the Ducks soon go in quest of, and when a number of them have got so far up the pipe, as to be completely under the net, some person shews himself behind them, and makes a noise, at which the birds take flight, and hasten to the extremity of the pipe, where the net gradually becoming narrower, completely encloses them ; and to prevent their return a piece of the net is loosened from the roof behind the fowls : when the birds are indolent, a number of tame Ducks, trained to the business, called decoy Ducks, are sent out, to induce (by their example) the wild birds to follow them ; which plan mostly succeeds. A very large variety are common to this country, most of which migrate southward at the approach of winter, and return to the north early in the spring ; but very few kinds breed in this country. *British Ornithology*, vols. 1, 2, 3.

14. *Aptenodydes*. PENGUIN. *Bill* strait, compressed, sharp-edged ; *upper mandible* longitudinally and obliquely grooved, the lower one truncate ; *tongue* furnished with reflexed prickles : *wings fin-shaped*, without quill feathers ; *feet* webbed, four toed ; *tail* very short, and rigid.

This is a very stupid inelegant tribe ; only found in the

least frequented seas, are gregarious, and feed on fish ; they are all covered with a thick short down ; they lay but one egg ; swim and dive admirably ; but from the position of their legs, which are situated at the extremity of their bodies, they walk badly. The skins of some of the species are dressed, and formed into various kinds of dresses, by the inhabitants of those countries where these birds are natives. None of the species are found in Europe.

15. *Pelicanus*. PELICAN. *Bill* strong, hooked or sloping at the point ; *nostrils* wanting, or placed in a longitudinal furrow : *face* and *gullet* bare of feathers, or only covered with very short down ; the *gullet* capable of great distention ; *feet* webbed, four toed, all connected.

All this family are expert fishers, are constant inhabitants of the sea-shore, particularly where it is rocky ; they are gregarious, extremely voracious, and usually build their nests which are composed of sea-weeds, on shelving rocks, the flesh of all the kinds is rank, and loathsome. The large white Pelican, (*P. Onocrotalus*,) sometimes builds its nest in dry sandy deserts, far from the sea ; from the capacity of their gular pouches, they are able to convey a considerable quantity of food and water to their young, though the nest has been known more than fifty miles, in a direct line from the nearest sea-coast, or river. The common Corvorant, (*P. Carbo*,) has been so far tamed, as to become familiar, and in some countries is used to catch fish, first having a leathern thong put beneath the pouch, to prevent its swallowing any fish it may procure ; all the species swim and dive well. Several species frequent the British Islands.

British Ornithology, vol. 2. This genus is divisible into such as have the edges of their bills smooth and cultrated, and such as have the edges serrated; the common Shag is an example of the former, and the Selan Goose of the latter.

16. *Phaeton*. TROPIC-BIRD. *Bill* sharp-edged, strait-pointed; *gape* extending behind the eyes; *nostrils* oblong; *hind toe* inclining forwards, all the toes webbed.

A genus, which is principally confined within the tropics; they feed on fish; are sometimes seen in numbers on the backs of whales and porpoises, as they lie asleep on the surface of the water, are all very shy, rarely appearing on land but during the breeding season; have been seen from fifty to one hundred and fifty leagues from any known land, or rock.

17. *Plotus*. DARTER. *Bill* strait, pointed, toothed; *nostrils* situated near the base, being a long, narrow, pervious slit; *face* and *chin* naked; *legs* short; *feet* webbed, the toes being all connected.

All these birds possess a small head, and a long, slender, retractile neck; they principally inhabit southern climates, and feed on fish, which they pierce with their long pointed bills; they have acquired the name of Darter, from the practice of darting their heads forward when in pursuit of prey.

In the families above enumerated, a great variety of forms, uses, and dispositions, are observable, but all tending in a greater or lesser degree to the harmony of nature; each

forming a link in that great chain. From the beauty and interest of various classes of Birds, the study of Ornithology has had more followers than either of its sister sciences, but still we have much to learn ; as almost every country has either some species, or whole families, peculiar to itself ; we have in enumerating the genera, occasionally remarked where any of the species were migratory, and we must not omit to notice the locality of others, as it forms an equally curious character. Many kinds never quit the frozen shores of Iceland, Greenland, Hudson's Bay, and other stations, where the cold is equally severe ; some species are as it were riveted to the burning deserts of Arabia, and the scorching sands of Africa ; whilst others cease to exist out of the temperate climates of Europe and Asia. In Great Britain we possess one kind of Bird which has not been discovered in any other part of the globe ; and though it has often been transported, with a view to naturalize the species in other countries, the experiment has never been attended with success, the species we allude to is the Red Grouse, (*Tetrao Scoticus*). Another kind of locality is observable in many of the small birds, which greatly contributes to preserve the kinds, that is they only frequent such places, where the ground assimilates with the colours of the various kinds ; thus the Norfolk Plover, or as it is usually (but improperly) called, thick-knee'd Bustard ; is never found but in stony districts, in arable lands, and where the ground approximates so nearly to it in colour, that the bird is secure from observation at the distance of a few yards, provided it is not in motion ; but lest this security should occasion too great an increase, the instant it runs or walks, its black coloured tail immediately discovers it ; and its loud shrill

cry also further aids its discovery. The Partridge, Quail, Corn Crake, and a multitude of others derive much of their security from a similar cause: the Ptarmigan and Snow Bunting, are entirely confined to the snow clad mountains of the north, whilst the Sandpiper on the shores of the ocean, are secure from the same cause, among the shingle of the beach. The different kinds of Titmouse frequent trees, whose rugged trunks being covered with various kinds of Moss and Lichens, their similarity of colour is so great that they are hardly perceptible, even at a short distance; the same may be said of the Creeper, common to this country, the Wryneck, and others; but it is to be remembered that in all these instances, either their notes, or some peculiar spots of a different hue, act as guards against their too abundant increase. The tail of the Ptarmigan, is all seasons of the year quite black, which when the bird is in motion, it mostly displays, and which of course betrays it; the Woodcock, whose sombre tints so exactly correspond in colour with the falling leaves of the forest, may be discovered by its white tail, and large black eyes; other contrasts could be enumerated *ad infinitum*, but sufficient have already been adduced to call the attention of the Naturalist to these interesting correspondencies.

We shall now proceed to point out those particulars most deserving the attention of the Naturalist, both as they relate to the habits, œconomy, and peculiarities of the birds themselves, and also, how far they contribute to the welfare, comfort, and support of the human race. What we remarked when speaking of Quadrupeds, is equally applicable to Birds, and other classes of Animals, that it is not by the

mere accumulating a large variety of curious species that the science is advanced, but it is by acquiring a knowledge of the habits and propensities, the contrasts, the similarities, the uses or injuries they offer to mankind, that gives life and spirit to the science ; and in fact is the true and only real use of the study.

When a new species is observed, both sexes if procurable should be obtained, with their nests and eggs ; notes should be taken of what places the kind resorts to, if its nest be placed in a tree, a hole in the ground, or if the eggs are deposited without a nest ; the number, colour, and size of the eggs ; the substance of which the nest is composed should also be remarked, as frequently, when almost every external mark would seem to warrant the blending of two species in one, the shape, or the material, of which the nest is formed, will afford excellent specific characters ; as it is a rule to which we know of no exception, that each species builds its nest with the same kind of materials, and places it in similar situations in all countries. The food of the species, its time of incubation, its term of life ; at what time of the year it migrates, and for what period, should, if possible be learnt.

In such cases as will admit, the nest and eggs should be preserved, the nest being first thoroughly dried and baked ; the eggs should be carefully blown, noticing if any material change is made in the apparent colour of the shell, by the absence of the yolk, &c. Eggs require considerable pains to preserve them whole, as unless the aperture at each extremity is made perfectly round without cracking the edges

of the orifice, there is considerable danger in exposing them to even a small degree of heat, which is often necessary, on account of insects depositing their eggs within or on the shells : we have found the most convenient instrument for this purpose, to be a strait triangular needle, fitted into a small handle like an engraver's etching needle, this, with a little practice, will enable any one to perforate an egg with nearly as much exactness as if turned in a lathe ; when the eggs are quite clean and dry, they should be affixed to pieces of paper, and the papers gummed to the bottom of the nest, which at any future time can easily be removed by immersing the nest in warm water for a few minutes ; when the eggs are placed in the nest, it may be useful to add any particulars relating thereto, on paper ; the nest should then be filled out to its usual size with any soft substance, and should be secured from the attacks of damp and insects.

As soon as a bird is obtained, if only wounded, the quickest mode of dispatching it, is by squeezing it across the breast, by introducing the thumb and fore-finger under the wings, and pressing with as much force as the size of the bird requires, by this method, the feathers are not soiled, and the animal is immediately freed from pain, an object always deserving the attention of collectors. Should opportunity offer to keep the injured bird alive, if it be only wounded in the wing, the best plan is to amputate the limb, which may be easily accomplished, by pursuing the following instructions.

Supposing that the upper joint of the wing be fractured ; the bird should be firmly held by an assistant, and the fea-

thers of the wounded part cut away ; having procured a long needle, with stout silk, it should be introduced just within the skin, and passing round the bone, should be again passed through the skin, but on the opposite side, the silk should be tied in a hard knot ; the wing being laid on a block of wood, and a sharp knife placed about a quarter of an inch below the ligature, with a smart blow of a hammer the limb will be removed ; by this mode no hemorrhage will ensue ; should the wound be in the lower joint of the wing, the same plan should be adopted, excepting that the needle in the first instance should be introduced immediately within the lesser bone : as soon as the operation is performed, the bird may be set at liberty, and a few days will generally effect a cure.

Considerable difficulty attends the preservation of soft-billed birds, their food being insects ; in lieu of which many of the lesser kinds will eat flesh parboiled, (having all fat removed,) cut very small, and mixed with crumbs of bread ; which should be given them with a quill, and that often, but not in large quantities at one time ; as soon as caught, the three or four principal quill feathers in each wing, should have their tips tied together with strong thread, which will effectually prevent their fluttering ; and for a few days, it will be better to confine them in boxes, the sides of which are covered with carpeting or other soft substance, to prevent their sustaining injury ; the boxes should be kept in a dark room, till the birds evince an inclination to feed themselves, when they may gradually be removed into the light, and caged. Soft billed aquatic birds, or waders, should have their wings tied, and be kept in the dark, these will

soon take bread and milk, with small pieces of raw flesh and seeds, mixed together ; this kind will bear confinement well ; they should have plenty of room allotted to them ; and the Aviary should be erected in some shady place, where the birds can at their option, either enjoy sunshine or shade ; could the Aviary be erected with a small running stream passing through it, the birds will the more readily become reconciled to their captive state ; the earth should be occasionally turned over with a spade, to afford them an opportunity of picking out the insects or grubs ; the worms, slugs and caterpillars, abounding in most gardens, will be greedily devoured ; and if occasionally a piece of putrid flesh, or other substance, to which flies resort to deposit their eggs on, was placed within their reach, the maggots hatched from them would be eagerly consumed.

Birds of prey, and the piscivorous kinds, may soon be rendered tame, by keeping them short of food for some time, these may be fed on most kinds of offal, and other animal substances.

Upon obtaining any kind of which we have no previous knowledge, our first care should be to learn such parts of its history as may have fallen under the observation of the natives of the country where it is found ; as also to what purposes it is applied ; whether it be noxious to agriculture, or otherwise injurious, and the measures pursued to avoid its injuries : if the flesh, down, feathers, or quills, are used, and if so, whether and how prepared, and for what purposes : its food, nest, eggs, places of resort, also require attention ; to facilitate these enquiries, we have affixed a table of par-

particulars worthy of notice, on a similar plan to the one already annexed to the conclusion of our remarks relating to Quadrupeds ; which will point out more particularly the desiderata in the history of Birds.

Birds should not be skinned till some hours after they are killed, that time may be allowed for the blood to coagulate ; as soon as procured, the colour of the eyes, legs, any bare or carrunculated skin, or other fleshy appendages, should be carefully noted ; as these parts are all more or less likely to change color soon after death. The body should be opened longitudinally, from the vent to the point of the breast bone, either with a sharp knife or scissors, the feathers being placed smooth on each side as the operation proceeds ; when the incision is made, the handle of the dissecting knife, or a thin smooth piece of hard wood may be introduced between the skin and flesh, and the skin loosened as far back as the shoulder joints, where the bones are to be separated ; this done, the skin must be drawn from off the neck, till the head appears, and should be parted at either the first or second joint from the head ; the skin is now to be drawn backwards to the thighs, and the joints carefully separated, leaving the thigh and leg bones attached to the skin, which will now only adhere to the rump, this had better be divided near its centre ; the more effectually to preserve the tail feathers : when the body is removed, the skin will be left with the inside outwards, affording an opportunity to remove any flesh or fat that may be left adhering, from which the skin must be thoroughly freed ; the eyes, tongue, roof of the mouth, brain, and all fleshy integuments attached to the skull, must be carefully removed ; after

which, the preserving powder, (recommended for the skins of Quadrupeds,) should be plentifully applied, particularly to the remaining part of the rump, the leg and wing bones, and to the skull; as it absorbs the grease, and renders the skin less liable to the attacks of insects.

The cavities of the head should be filled with cotton, tow, or other soft substance, at the same time introducing a quantity of the powder: where the subjects are very large, a difficulty will be experienced in retaining the leg and thigh bones: but these instances will be rare, and in such cases the Collector will use his own discretion; in every case, when the bones are retained, they must be carefully cleansed from all muscular parts.

The tongue, and if any curious appearance is visible in the tracheæ or wind-pipe, these should be preserved in spirit, with the solution of allum, (as before directed) as these parts will often assist in ascertaining the genera or species to which the individuals belong.

A considerable degree of practice is requisite to enable any one to skin and stuff birds well; and no person should attempt the latter, who is not in some degree acquainted with the general outline of their history; so much at least, as to enable them to give to each bird its appropriate attitude, as without attention to this particular, the animals stuffed, will only excite disgust and disappointment, in the minds of any persons who are acquainted with the subjects: we frequently see a bird that does not perch, placed on the stump of a tree; or one, whose haunts are confined to the shores

of the ocean, represented as inhabiting the recesses of a forest: inattention to these particulars is unpardonable, and though some of our modern "improvers upon nature," certainly stuff birds well, these incongruities completely destroy the effect of what may perhaps be otherwise well executed.

We would earnestly recommend every person wishing to become an adept in the art of Bird-Stuffing, to see it performed by some experienced and ingenious Artist, it being no easy task to instruct any one, without some practical illustration; the general outline is the same as mentioned under the head Quadrupeds; one principal wire should pass from the point of the rump, through the body, and out at the crown of the head; lateral wires should be passed through the wings and legs, and attached to the main one; common tow will be found to answer as well as any thing for stuffing, it should be wrapped round the wire beginning at the neck, gradually enlarged so as to fill out the body, and the antiseptic powder should be from time to time introduced with the tow; when the skin is filled out to its natural size, it should be carefully sewed up, and the feathers smoothed over the seam. The eyes are to be inserted in the same manner as in Quadrupeds: the mouth should be filled with cotton or tow, and as much of the powder as can be contained, and to prevent the bill from gaping, a piece of fine wire may be passed through both mandibles, and the points neatly turned, the upper point may be bent down into one of the nostrils, and the lower one into the base of the bill.

The drying of the skins when first obtained, and the packing, are in all cases to be performed as for Quadrupeds.

Skins of birds, when in a dry state, must be placed between damp cloths, till pliable, by which process they will not sustain any injury, provided they are not kept so long damp as to rot the skin ; twenty-four hours will not in any case injure ; but in warm weather, the shorter the time, the less likely is the skin to be impaired. Birds kept in a state of confinement are very subject to be infested with vermin, to rid the skins of which, it will be advisable to steep them in a strong solution of Allum, and Corrosive Sublimate, this will mostly destroy all insects, after which, the skins may be stuffed in the usual manner, and dried ; to prevent any of the Allum from crystallizing on the feathers, as soon as the skin is taken out of the solution, it may be well washed in clear water ; these precautions apply to all Animals kept in a tame or domestic state. When stuffed, the skins should be dried in the same manner, and with the same precautions as those of Quadrupeds ; in placing them in their respective cases, a piece of Camphor should be introduced into the case, as its effluvia is obnoxious to insects, and it at the same time covers any ill smell arising from the skin ; dried flowers, grasses, mosses, lichens, and various kinds of sea-weed, may be occasionally used with considerable effect, to ornament the cases, and give a more natural effect to the birds : care must be taken that all flowers, &c. be baked in a slow oven for a considerable time, previous to their being used, to destroy any insects, their eggs or larvæ, that may be attached to the flowers, leaves, or stems.

The instruments requisite for this department are nearly the same as for the preceding, but only on a smaller scale; the only additional ones are some strong blunt needles, and some strait triangular ones, fixed in small handles, the former to assist in smoothing and adjusting the feathers after stuffing, and the latter, to puncture the eggs for the purpose of blowing.

The Gun offers the most certain mode of obtaining specimens, and in most cases is the only one that can be pursued with much probability of success; in the using of it, care should be taken to apportion the size and quantity of shot, to the bird about to be destroyed, as want of care in this particular has occasioned the loss of many valuable species. Some kinds may be obtained by steeping seeds, berries, or grain, in some deleterious infusion; the berries of *Coculus Indicus*, commonly called French berries; the nut called *Nux Vomica*; strong decoctions of *Cardamums*, or spirits, will also answer; the latter kinds have this advantage, that the birds will only be stupified by feeding on grain soaked in them, whereas the two former mostly prove fatal. Many kinds may be taken either in common folding or clap nets, or in nooses formed of stout horse hair, having one end fastened to a stout peg that should be driven into the ground, and then made into a noose or running knot, these should be placed in situations to which the particular kinds wanted, are accustomed to resort; the size and texture of the material of which the noose is formed, should be proportioned to the size of the objects purposed to be caught. The nooses should be sufficiently large to permit the birds to pass their feet into them, and should be well secured;

berries, grains, or any substance on which the kinds feed should be strewed round the spot. Many of the Hard-Billed small birds may be taken by this mode, as also, numerous kinds of the large granivorous kinds, likewise the waders, particularly the Snipe, Woodcock, and their affinities.

The Soft-Billed small birds, may mostly be caught either in common trap-cages, or in what are generally called Nightingale traps, which should be baited with meal-worms, or other insects.

Water Fowl, particularly those that dive, may be taken by drawing the places to which they resort, with a common Drag-Net, one person should be sent forward up the sides of the stream, but out of sight of the birds, and at a given time, when the net is arranged, should return by the water side, and endeavour to alarm the birds; most kinds of which dive immediately, and continue so to do, as long as the objects of alarm are apparent, most, if not all divers, pursue their course down the stream, if it be a river, to its influx with the sea; or if a creek, or branch of a river, to the river itself; and if the net is judiciously managed, great numbers may be thus obtained. Practice is of course requisite to command success in any of the proposed methods, but with a little attention, any one may attain to considerable perfection.

The plan already alluded to, under the head Bat-Fowling, may be pursued with considerable effect, particularly on

the borders of woods; and many kinds may be frequently obtained, by persons residing on the sea-coast, in the vicinity of light-houses, (we have known many hundreds obtained in the course of a few days,) the birds in their passage, particularly during the prevalence of easterly winds, often fly with such force against the windows or lanthorn, as to be quite stunned, and are frequently found dead; from this circumstance it is to be observed, that a very considerable proportion of the migratory birds, pursue their routes in the night time.

1818	1819	1820	1821	1822	1823	1824	1825	1826	1827	1828	1829	1830	1831	1832	1833
Memorandum. We were exceedingly amused this day, in observing a number of small birds running up the trunks and branches of some large Elms, seeming to pry with anxious curiosity into every crevice of the bark; we shot several, but could not discover any sexual difference. The species belonged to Order 1. Genus 6. Titmouse.		10													
		Length.	Breadth.	Wt.	Food.	Places of resort.	To what purposes applicable.	Nest and Eggs, and times of migration.	Note.	Colour of eyes.	Colour.	Proth name.			
		Five inches and a half, of which the tail alone measured two inches and a half.	6 inches and a half from tip to tip of the wings when expanded.	3½ drains.	Insects, their eggs and larvæ; flesh, young birds, carrion and grain.	Woody places, principally large old trees; whose trunks are mossy.	The Natives use the wing and tail feathers, as ornaments to their head dresses; in their wars they only use the black feathers, but at other times both the red and black. The skins and feathers are of considerable importance, as they are among the principal objects of barter with several tribes of the Natives: the flesh of the young birds is eaten, as also their eggs.	Nest composed of moss, wool, hair, and feathers, mostly pendant, or else placed in the forked part of a branch of some small tree, the entrance at one side. Eggs transparent white, finely sprinkled with red; in number from 12 to 20. The species is a constant resident.	A continual twitter.	Dark hazel.	A confused mixture of Ash colour and brown, with some dark patches.	Bottle Tit. Ragged Robbin.			
		From the tip of the bill to the tail, 4 ft. 5 in. from the tip of the bill to the toes, 6 feet.	From tip to tip of wings 10 feet 2 inches.	About six pounds.	Fish, aquatic insects, reptiles, & vegetables.	The shores of the sea, rivers, on the banks of large lakes, and salt water inlets.		Their nest is composed of sticks and decaying vegetables, placed on a hillock in some shallow pool, the birds sit on the nest with their legs hanging over its sides. Eggs two, perfectly white. Migrates to the West in autumn, and returns East, early in the spring.	A harsh scream.	Dark hazel, soon after death, becoming covered with a white film.	Large quill feathers black, all other parts a bright scarlet.	Tococo, and by the European inhabitants Flamingo.			

Saw an immense flock of the last named bird.

We shot two Swallows, which exactly resembled the common Chimney Swallow, we were informed by the inhabitants that they arrive about the end of October, and quit towards the end of February.

We observed large numbers of wild fowl on a salt water lake, but were unable to procure any, as the instant we approached they took wing: the next morning we repaired before day-light to the same spot, and were so fortunate as to kill several, they were Mergausers, and from the confused mixture of their colours, were evidently either young birds, or deeply in moult, they are only seen in these parts after unusually wet seasons; we could learn nothing of their history.

Observed the Swallows congregating, as they do in England, (previous to their leaving it), this continued for several days, but on the wind shifting to the South-east, they all departed.

We found a nest with several greenish white eggs, minutely spotted with brown, but though we did not touch it we never observed any bird frequenting the spot for several weeks; we therefore possessed ourselves of it, and found each of the eggs had a small hole in one end, and on removing them out discovered the bones of some bird beneath, which was probably the parent, but how destroyed or the eggs, punctured, we could never ascertain.

CLASS III.

Amphibea. REPTILES.

THE Amphibæ, or Reptile Class of Animals, are dispersed over most parts of the globe, but the species are more numerous in warm climates. The forms of many are disgusting, their haunts, loathsome and appalling, and the power possessed by numerous species of inflicting wounds, often of fatal effect, is terrific; notwithstanding which, Man has reduced divers kinds to contribute to his support, or to add to his comforts or luxuries.

In interior conformation, many kinds have a near affinity to fishes; which is also observable in the exterior form and habits of several species. Some of the individuals of the first Order, contribute a large supply of food to Mankind, for which purpose they and their eggs are sought after with great avidity; the shells, or exterior coverings of these Animals, afford that elegant substance for the use of the

Mechanic and Manufacturer, commonly denominated TORTOISE-SHELL. Of the Frog tribe, several species are in common use as food, as also various species of Lacerta ; and even of the Serpent family, Man has deigned to select some, as applicable to the purpose of Food or Medicine, particularly the VIRER, common to Great Britain. In other countries, some of the most formidable and dangerous in the catalogue of poisonous Snakes, are rendered in a degree domestic, and are so far tamed, as to perform numerous tricks for the diversion of idle spectators in the East Indies ; where *Coluber Naja*, the HOODED or SPECTACLE SNAKE, (or as it is more generally called, the *Cobra de Capello*,) whose bite has been known to produce death in less than an hour, is a common companion of the jugglers, who having extracted the fangs, have nothing to fear from its bite.

The colours of many species in the different genera belonging to this class, are exceedingly beautiful, and in their forms and motions a great degree of elegance is observable ; some surprise us by their enormous bulk, and extraordinary strength ; others, by the elegant disposition, and contrast of their colours ; their vivacity and peculiarity of structure ; yet as many of the kinds possess the poisonous fangs, they are all looked upon with a mistrustful eye, so much so, that Men who have braved the din of war, with all its horrors, who have stood unappalled, amidst the cannon's dreadful roar, have been almost petrified with fear at the sudden approach of a harmless Snake.

If our finite ideas do not enable us to perceive the uses of this class of Animals, or to penetrate into that inscrutable

wisdom with which all things are formed, and by which is dispensed unto every living thing its allotted portion of good, we should not arraign that power for permitting the existence of what we may consider as evils, or at best as useless Animals, without our being able to comprehend the purposes for which all things are made.

The Amphibææ are divided in two natural families or orders ; in the first of which are placed those Animals that possess feet or fins ; and the second contains those destitute of feet. The whole class are cold blooded ; their bones cartilaginous ; in some, the respirative organs are large, but in all are imperfectly defined ; their respiration is slow, as is also their powers of digestion, and the circulation of the vital fluid ; most of them are very tenacious of life, some possess the power of reproducing parts that have been destroyed or mutilated ; many species are amphibious, others entirely aquatic, surviving but a very short time on being removed out of water ; whilst many other kinds cannot survive in it. A considerable proportion of those inhabiting the colder parts of Europe, Asia, and America, become torpid during winter.

ORDER I.

REPTILIA. *REPTILES.*

Of the Animals in this Order, a considerable number are entirely aquatic, only approaching land for the purpose of depositing their eggs ; these are confined to the first genus, the whole of which consists of Animals covered with a hard,

bony, or horn-like covering, or shell, they are very prolific, their motions on land slow, and they are possessed of vast strength. The principal food of the marine or aquatic kinds, consists of moluscæ, sea-worms, and weeds, those that reside on land, feed on vegetables, insects, worms and snails ; several species of both kinds are in great request for the purposes of food.

The other genera in the order, mostly inhabit sheltered retired places, some of all the genera are sub-aquatic ; several species are used as food.

1. *Testudo*. TORTOISE or TURTLE. *Body* covered with a *bony shell*, which is coated with a horny, scaly, or coriaceous *integument* : *mouth* without teeth, the upper mandible closing over the lower, the edges of the mandibles are in some species furnished with tooth-like processes ; *feet* or *fins* four ; *tail* short. This genus is divided into TORTOISES, which have *clawed feet*, and reside on land ; and TURTLES, which are usually aquatic ; these last are again divided into MARINE and RIVER TURTLES, the Marine species have their *feet fin-shaped*, and entire, and the fresh water kinds have *palmated feet*.

Most of this genus are natives of warm countries, but few of temperate climates, and not any of cold ones ; some of each kinds are used as food, and the shells of many species afford (as above remarked,) the substance called Tortoise shell. They are all very tenacious of life, instances having occurred of their surviving for several days after having been

deprived of their heads. They are perhaps the longest lived of all animals. The land kinds generally reside in woody places, in the vicinity of pools or small streams, most of these form burrows, to which they retire during wet or cold weather. The fresh water species resort to lakes and rivers, particularly where they are muddy; many of them bite desperately, and attack with much ferocity.

2. *Rana*. Frog. Body naked; feet four; tail (in the adult) wanting. This genus is divided into Frogs, which have smooth *bodies*, and long *legs*; and Toads, which generally have their *bodies* warted, or pustulated, and short *legs*. The motions of the latter kinds are slow, usually crawling, and their aspect disgusting; whilst the actions of the Frogs are lively, and they generally leap. They are further distinguishable by their different modes of depositing their *spawn*; that of Frogs is in *jelly-like masses*, and of Toads is a kind of *double chain*, frequently several feet in length. In most of the species the *fore-feet* are four toed, and the *hind ones* five toed, without claws; in those kinds called TREE-FROGS, the *feet* are palmated, and furnished with *round tubercles*, from which exudes a glutinous substance, which enables them to adhere to the leaves and small branches of trees, amongst which they constantly reside.

All these Animals feed on insects and worms, and are themselves the prey of Water-Fowl, Snakes, other Reptiles, and Fishes; some of the species are used as food by Man. They mostly frequent low, damp, noisome places, particularly

the Toads ; a few, as above remarked reside in trees, and most of those that are natives of cold countries, become torpid during winter.

3. *Draco*. FLYING-LIZARD or DRAGON. *Body* tuberculated, or rather roughened with minute scales ; *feet* four ; *toes* divided ; *tail* long ; the *sides* of the *body* furnished with *membranous appendages*, strengthened by rows of small bones ; by which the animal is enabled to support itself as with wings.

This genus, of which only one species is known to exist, feeds on insects and worms, it generally resides among branches of trees ; in leaping from tree to tree, it is assisted by its wing-like appendages.

4. *Lacerta*. LIZARD. *Body* long, slender, naked ; *feet* four ; *toes* divided ; *tail* very long. This very numerous family is divided into CROCODILES, which are covered with *hard scaly protuberances* ; *tail* two-edged ; *tongue* short. GUANAS, these have their *backs toothed or fringed* ; and their *heads* covered with *carunculated calosities*. LIZARDS, having their *bodies* covered with minute *scales* ; and the *abdomen* covered with large square *plates or scales* ; *tail* very long. CHAMELEONS, *tongue* club-shaped, tubular ; *tail* roundish, prehensile. SNAKE-LIZARDS, these crawl on their bellies, and form the connecting link between the Lizard and Serpent tribes ; their *legs* are very minute, in some, the *feet* are without *toes* ; others have only *two feet* placed forward, but situated high up their sides ; and some possess *two feet*, placed almost at the extremity of their tails.

In an extensive tribe like this, where the individuals are so exceedingly numerous, great variety will naturally occur in size, disposition, and habits. CROCODILES are confined to large rivers and lakes, in the warmer parts of Asia, Africa, and America, they are all carnivorous, and attack almost every kind of Animal that approaches their retreats, not excepting Man. Some species grow to a vast size, attaining the length of thirty feet. These are oviparous, depositing their eggs in the sands, and frequently the young are devoured as soon as they quit the shell by their parents. GUANAS are natives of Africa and America, and most of the kinds are esteemed delicate and nutritious food for Man; they resort to woody, shady, and some, to sandy places, and feed on insects, and worms; they are generally oviparous.

LIZARDS are principally insectivorous, some reside in sand banks, or among the roots of trees, others, in dry sunny places; some are viviparous, others oviparous, and several become torpid during cold weather. CHAMELIONS, are generally found in trees, among the branches of which they almost constantly reside; they are natives of warm and temperate climates. The power of changing the apparent colour of the skin in these Animals is highly curious, and though proverbially ascribed to this particular tribe, is also possessed by many of the Guanans and Lizards. NEWTS, reside principally in the water, and feed on worms, and aquatic insects. SNAKE LIZARDS, inhabit moist fields, and meadows, in warm countries; none are found in Europe.

5. *Sirin*. *Body* naked ; *feet* either two or four ; *tail* long.

These are Animals of most singular structure ; being furnished with exterior *gills* like fishes ; but *footed*, and in habits corresponding with reptiles ; they are amphibious.

ORDER II.

SERPENTES.—SERPENTS.

The numerous individuals comprising this extensive tribe of Animals, are generally of a forbidding or terrific aspect, and have their residences in damp unwholesome places. Their bodies are long and tapering ; their jaws capable of great distention, and their motions, either a sudden bound, or an irregular undulating writhing of their bodies. Many of them are armed with a deadly poison, by means of which they secure such Animals for food, as would either overcome them, or escape from the quickness of their motions ; but to guard Man and other animals from their fangs, Providence has awarded to most of the poisonous kinds, either such violent contrasts in their colours, or formed their scales in a manner, that they make a rustling sound on the slightest motion ; a few kinds possess horny appendages to their tails, usually termed rattles ; by which all animals are put on the alert, as the sound is heard at a considerable distance ; most poisonous Snakes have the fangs with which they inflict their wounds, large and protuberant ; and the scales on the upper parts of their bodies keeled or carinated.

The food of all the species is animal ; some of the larger

kinds possess such great strength, as to enable them to seize and destroy Animals of the size of an Ox ; and even Man himself is sometimes overcome by these immense creatures ; but few if any of the very large Snakes are poisonous ; but destroy their victims by mere muscular compression, as when once any animal becomes encircled in their enormous folds, the contraction of their muscles is sufficient to deprive it of life ; the lesser kinds feed on Birds, the lesser Quadrupeds, Frogs, Lizards, and even their own species. They are devoured by Birds of prey, Swine, and more particularly by the Weesel tribe, who wage constant war against the whole family, and are kept for this purpose in a half domesticated state, in many of the warmer climates.

Most of this class are oviparous, depositing their eggs amongst heaps of decaying vegetables, in dung-hills, under hay or corn stacks, or similar places ; some kinds are viviparous, or to speak perhaps more correctly, ovaviviparous ; hatching their eggs internally : they are mostly land animals, though some kinds readily take the water ; and a few are amphibious ; those resident in cold countries, become torpid in the winter ; all of them are capable of abstaining from food for a great length of time, in some cases, from four to six months and upwards.

The broad scaly plates on the bellies of Serpents are called *Scuta*, and the smaller or divided plates beneath the tail *Subcaudal Scales* ; from the number, absence, or disposition of these scales, the Linnean genera of Serpents, are chiefly constituted.

1. *Crotalus*. RATTLE-SNAKE. *Scuta* on the belly ; *scuta* and *scales* under the tail ; *tail* terminated by a number of hollow, horny joints, loosely fitted into each other, and which, on the slightest movement of the Animal, make a rattling sound ; from whence its name.

The whole of this genus, are highly poisonous, and stand pre-eminent in point of danger, the bite frequently proving fatal in a few hours, the poison is situated at the base of their canine teeth, and is contained in sacks, which communicate with apertures on the inner side of the fangs, at a short distance from their points ; the poison is pressed from the sacks, at the instant the animal inflicts its wound, and enters with the teeth into the part bitten. These are generally inactive, frequenting retired woods, are mostly natives of America ; some kinds grow to a considerable size.

2. *Boa*. *Scuta* on the belly and beneath the tail.

Some of this genera are the largest of the Serpent tribe, having been known to attain the length of from thirty to forty feet ; they inhabit the interior of Africa, India, South America, and the Isles situated in the Indian Ocean ; they are the terror of the inhabitants ; preying on almost every kind of Animal that ventures near their retreats ; as Cattle, Deer, and sometimes Man. None of the genus are poisonous.

3. *Coluber*. VIPER. *Scuta* on the belly ; broad alternate *scales* under the tail.

A very numerous tribe, nearly one half of which possess

the poisonous fangs and appendages ; they are extensively dispersed ; frequenting lonely places, and feeding on Frogs, Lizards, small Birds, and Quadrapeds. Their flesh is accounted very nutritious, but previous to its use the head should be taken off, or the fangs extracted. In case of a bite from one of this tribe, the immediate application of Olive oil to the part, and a sufficient quantity taken internally, to prove emetic, will often effect a cure in a few hours. One species is a native of this country, and is the only venomous reptile common to Great Britain.

4. *Hydras*. WATER-SNAKE. *Body* thickened in the middle, and gradually tapering towards the extremities ; *tail* flattened.

The whole of this genus inhabit water ; through which, they dart at their prey with the rapidity of an arrow ; they feed on small reptiles, insects and worms ; and but very rarely are found on land.

5. *Langaza*. *Scuta* on the abdomen ; *tail* marked at its commencement, with circular *divisions* or *rings*, and terminated with small *scales*.

This curious genus of which only one species is known, has the upper jaw protruded in the form of a snout : its bite is considered as particularly venomous.

6. *Achrocordus*. WARTED-SNAKE. *Body* covered with *tubercles*.

The Warted Snake is a native of Java, generally resorting to the plantations of pepper, and sometimes attaining the length of seven feet. There is only one known species.

7. *Anguis*. SLOW-WORM. Scales on the belly and under the tail.

None of this genus possess the fangs necessary to inject poison, though some of the species are furnished with the sacks in which the poison is secreted; the kind common to this country is perfectly harmless, and is generally known by the name of BLIND-WORM, it is capable of existing without food for many months; as likewise without air, or at least a change of air, for a very considerable period; I had two sent from the country several years ago, (as objects of great curiosity,) the person who had them in charge was particularly timid, and had them put into a wide mouthed bottle, which was corked up and cemented close, on their arriving in town, no convenient opportunity occurring to send them to me, and the family being uneasy at having animals of this description in the house, it was considered as most prudent to bury them, till a convenient opportunity might offer: by accident I was passing the house of the person in whose charge they were, and called, when I was informed of the good care taken of them; they were dug up, and to my great surprise, were alive, though very inactive, the time they had been thus incarcerated, was rather more than six weeks. On my return home, I liberated them, and exchanged the bottle for a small wire cage, in which they lived for nearly two years, becoming torpid in the winter, and exhibiting signs of returning animation towards the end of

April, but did not feed for several weeks afterwards; their food was winged insects, and worms; the flies they caught with great adroitness, watching with much patience till any settled on the wire of the cage, or on a tuft of grass that was within, when they were at a proper distance, the Snakes darted out their tongues, and the flies were affixed to them (by a viscid exudation) in an instant; however long they might have been without food, I never saw one attempt to swallow or even notice dead flies that were often put into the cage for the purpose of experiment.

One of them died late in the year; and the other became torpid as before, but did not recover from its torpidity at the return of spring. I therefore took it out to examine, but found it to all appearance dead, yet still quite plump and flexible; this was towards the end of April; it was then returned to its cage, and it escaped further notice till after the twenty-fourth of May, when on again inspecting it, the skin appeared loose, and the flesh had shrunk considerably, though its flexibility was still preserved; it was then exposed in a situation where it was in the influence of the sun, during the whole day, but no change taking place, I considered it dead, and placed it in a glass jar, which I filled with a solution of Allum, and Spirit of Wine, this was in the evening, on going into my room the next morning, I was shocked to see the poor animal alive, seemingly in great agony; its eyes and mouth open, but both covered with a thick film; I immediately poured off the solution, and in its place, filled the glass with pure rectified spirit, which in a few minutes killed it.

8. *Amphisbæna*. *Rings* on the body and tail.

All the species belonging to this genus, are without scales, having smooth cylindrical bodies, of equal thickness throughout, and the extremities so obtuse, that the head is scarcely distinguishable from the tail. They are all natives of America.

9. *Cæcilia*. *Wrinkles* on the body and tail; the upper lip furnished with two *tentacula*.

Natives of South America, and India.

Having, in enumerating the essential characters of the genera, given such general outlines of their history, and æconomy, as will enable the Naturalist to arrange them into noxious, innoxious, and useful; as also, to put him on his guard against such as are venomous, we proceed to point out the methods to be adopted in the preservation of the skins and shells, of the various kinds comprised in this class.

The larger kinds of Turtles and Tortoises, should have the under part of the throat opened, leaving the skin surrounding the aperture for the protrusion of the head, as entire as possible, and with a long sharp knife, the whole of the contents of the shell should be removed, as also the fleshy parts adhering to the head; or the head and neck, with as much of the skin as can be conveniently left adhering, may be taken off, these should be cleared of all blood and impurities, and then immersed in a strong solution of burnt Allum, for a few hours, after which, it should be removed into a jar,

and completely covered with the same kind of preparation as directed for preserving Quadrupeds in spirits, the feet and tail may also be preserved in the same way.

After all the flesh and integuments are removed from the interior of the shell, it may be placed in a clear running stream, or in clean water, for a week or ten days, when it should be examined, and any parts of the flesh or skin that may be found adhering removed, it should then be suffered to dry gradually in the shade : all the smaller kinds may be preserved entire, for these, it will be proper to mix one half of pure spirit, with an equal quantity of solution of Allum ; the latter to be made by pouring three pints of boiling water on one pound of burnt Allum, which should be suffered to cool previous to mixing it with the spirit. Frogs, the smaller kinds of Lizards and Serpents, are best preserved in the last-mentioned preparation ; as likewise the eggs of such as are not covered with a hard shell.

The larger kinds of Lizards, as Crocodiles, Guanias, &c., should be skinned, the former as already directed for Quadrupeds, leaving the same bones, using all the precautions, and the same antiseptic powder, as there recommended. Guanias may be opened along the belly, and the leg bones and skulls retained ; the powder should be well-rubbed on the inside of the skin, and the interior of the head, both within the mouth, and where the body is separated from the head. Snakes that are too bulky to be preserved entire, should be opened just above the vent, and the tail first extracted from the skin, which can easily be stripped off the other part of the body, leaving the head entire, as in the

last kinds : no other precautions than those already enumerated, are necessary to preserve the skins.

When first obtained, the colour of the eyes should be observed if possible whilst the animal is alive, as they quickly become covered with a thick film after death.

Snakes form very interesting subjects in a cabinet, when well preserved, and stuffed, as do all the Lizard tribes ; to give them a natural attitude void of stiffness, is the principal difficulty. For the Snake tribe, a wire proportioned to the bulk of the Animal should pass longitudinally through its whole length, this wire must be enveloped in tow, or other soft material, till it has acquired the full size of the skin, which being first dampened, should be drawn over the wire, a small quantity of the powder may be introduced with the stuffing ; before the skin is quite dry, it should be placed in its proposed attitude ; the apperture on the belly must be neatly sewn up, and the stitches made as small as possible ; when quite dry, it will be of use to slightly glaze over the skin with spirit varnish.

Lizards, and the other Animals belonging to this class, should, in stuffing, be treated in all respects as the smaller kinds of Quadrupeds or Birds. The shells of Turtles or Tortoises should be varnished, which heightens the colours, and prevents the integument from peeling off.

We received the particulars of the following anecdote from an Officer long resident in Java, and as it contains several useful hints, we venture to give it publicity. He says " we

arose early, purposing to reach ——, before the sun had acquired any considerable altitude, but an occurrence of a nature perfectly novel, (to us) completely frustrated our operations for the day. On advancing towards a small wood in the front of which was a large clump of high grass, and canes, our ears were suddenly assailed by the cry of some Animal, evidently in great distress, on turning our attention towards the spot from whence the noise continued to proceed, we had an indistinct view of some Animal, writhing on the ground, whilst at the same time, the trunk of a tree close by the spot, seemed as if it were being stripped of its bark; our guides were in the greatest terror, and assured us it was an enormous Snake, that had entwined itself round the trunk of a tree, to await the approach of some Animal, which is the constant practice of this and other large species; on being convinced of the truth of their assertion, we all loaded our pieces, and after many entreaties, accompanied with threats, our guides were induced to advance with us; after some difficulty, owing to the unevenness of the ground, and the fear of encountering one of the enormous animals unawares, we arrived unperceived by the Snake, within fifty yards of it, but too late to rescue its victim; the Snake appeared to be licking with its tongue the lifeless body of some Animal, but of what kind we could not ascertain, though from its possessing horns, we concluded it to be some large species of Deer.

Having agreed to fire singly, that we might with more certainty observe if the ball took effect; a shot was fired, which evidently struck it, as it made a sudden bound, but did not quit its position, it continued gazing towards the spot where

we were, a small bush and some high grass completely skreened us from its view, whilst being on rising ground we could distinctly observe all its motions. On the second fire the ball struck it on the forehead, which it entered, and continuing in a horizontal line, passed into the vertebræ; the Animal instantly fell; and the head and fore part of the body lay without motion, excepting the tongue, which was thrust out of the mouth and violently agitated: its tail was continually moving, sometimes lashing the ground with violence, and at others, completely incircling the trunk of the tree, round which it had so recently entwined itself in security.

The Natives seeing the monster likely to be overpowered, began to shew some little courage, and informed us that if a blow could be given behind the head, but not to sever it entirely, the Animal would quickly expire; and it seeming probable that could the blow be struck before it recovered from the stunning of the ball, it might be effective; our English servant volunteered in the service, armed with a scimitar and a small axe, and accomplished his task; after which we all approached, our guides having by this time acquired as much courage as any of us. It was one of the most beautiful though horrid sights imaginable; the whole Animal was convulsed, and its writhings and contortions were dreadful beyond expression, during which its colours were heightened in brilliancy, and were continually changing; its eyes, which when first wounded, were closed, now seemed to flash fire; and possessed an expression that is not describable; in a short time it began to grow languid, and after a

few violent wrathings, it became nearly motionless, but nearly an hour elapsed before it expired.

The Animal it had killed was an Antelope of large size, but so altered in shape, that had it not been for the horns and hoofs, we should have been unable to ascertain what it was; the body had been compressed, and so completely flattened, that it was more than seven feet in length, and the legs were hardly distinguishable; the whole carcass was smeared over with a thick slime, which, we could not be certain if occasioned by the licking of the tongue, or whether it might not be an exudation from between the scales of the Snake.

On examining the Snake, its extraordinary bulk, and great beauty of colours, induced us to forego our intended journey, conceiving that its skin might prove a valuable acquisition to the cabinet of some European friend, we therefore resolved on slaying it, though we were very deficient of instruments proper for the purpose. The Natives, who but a short time before were so cowardly, might now be seen sitting on the dead body, and we had some trouble in preventing their cutting it to pieces.

To slay it was a task of considerable difficulty, from its great length and bulk; as it measured twenty-seven feet nine inches in length, and three feet four inches in girth, at four feet distance from the head. We first made an incision along the throat, and separated the head where it was first wounded, stripping down the skin; this was a most

formidable task, but having begun we determined to proceed ; after securing a rope round the upper part of the neck, one of the guides climbed the neighbouring tree, and passed one end of the cord over a strong limb of the tree, by which the body was hauled up as the operation of skinning proceeded ; we were several hours in accomplishing the undertaking, but finally succeeded, better than our most sanguine expectations could have induced us to hope.

When this was done we gave up the carcase to the natives, who immediately fell to work, cutting it up in long thin slices, and carefully collecting the fat, which they assured us was a specific in the case of a bite from any venomous creature, and that when any of them were bitten by a poisonous Snake, they immediately annointed the wounded part with the fat of Snakes, and melting a quantity, administered it to the party bitten. They dry the greater part of the flesh, and reserve it for future use ; and they use the skin cut into lengths about four inches wide, as ornaments, and for girdles.

Our servant soon after the skin was packed up and placed on a mule, informed us, that he had partaken of part of the flesh broiled, and that it was quite palatable ; its appearance was not tempting, but from motives of curiosity we were induced to taste it, the flesh was firm, well flavoured, exceedingly tender and juicy, and 'tis probable, had it not been for the scene we had so recently been witnesses to, we might have made a hearty meal from off it."

1886	Memorandum	Length A.C.	Food.	Place of resort.	Colour of Eyes.	General colour.	To what purpose applicable.
Jan 3	We observed this morning something floating along the river, which on its reaching the shore we found to be a large species of River Turtle, it was exceedingly fierce, and endeavoured to bite whatever approached near it.	17 inches long, 13 in. broad, weight, 37½ pounds.	Worms, molluscs, and seaweed.	Deep clear water, that is but slightly impregnated with salt.	Iris pale yellow, orbits green.	Back, olive green tinged with brown, belly, silvery grey.	The flesh is particularly fine, and we preferred it to that of all the other kinds; the shell is of little value being soft.
5	Were surprised by the loud and continued chattering of numerous Parakeets, that were evidently alarmed, on approaching the tree were they were, we found it tenanted by immense numbers of small frogs of which we took several, and found they adhered firmly to the leaves of the tree by means of a thick gluten, which exudes from their globular toes.	22 inches.	Various species of Aphids or plant lice, also other kinds of insects.	Principally in habitations of trees, in warm sheltered situations.	Bright gold colour.	Back bright green with two longitudinal yellow lines on the sides; beneath, greenish, or dirty white.	They are devoured by Crows and other Birds, as likewise by numerous kinds of Snakes and Lizards.
May 16	Caught a large Lizard, with a strong tooth-like process along its back, we saw many of the same kind, but scarcely two specimens agreed in colour.	From four to five feet.	Insects and vegetables.	Rocky and woody places, always preferring shade, is easily tamed, and soon learns to follow any one in the habit of feeding it.	Reddish yellow.	General colour green, variegated with red, orange, and blue.	Flesh used as food, of which it forms a considerable part with many of the mountain tribes, who catch them by throwing nooses over their heads.
Aug 20	On our journey this day we met with a Snake of very large size, which we killed, it belonged to Genus 2. Boa.	27 ft. 9 in. girth 3 feet 4 inches.	Most kinds of the larger Quadrupeds.	Amongst the branches of trees, in the vicinity of water.	Iris of fire colour with green reflections, soon after death covered with a thick film.	Pale brown, interspersed with ash colour, and dark brown, with rows of oblong black patches on the sides, each spot surrounded with a band of red; belly silvery blue.	Flesh eaten, the fat used as a remedy against the bite of venomous Snakes, and the skin is worn for ornaments and girdles.

CLASS IV.

Pisces. FISHES.

FISHES with but few exceptions, constantly reside in water ; they breathe by the means of *Gills*, and swim by the assistance of *Fins* ; their bodies are mostly covered with cartilaginous plates or *scales* ; they are all destitute of *Feet*, are cold blooded, and though capable of breathing through their gills, this function does not appear of the same importance, as it is to most of the preceding tribes ; seeming rather accessory than positively requisite, from the great length of time between their inspirations, and the slow circulation of their blood,(which by the way, is we believe, constantly in the same ratio as the power of elaborating air in the respirative organs;) their motions through the water are facilitated and regulated by their fins, of which the *Caudal* or tail fin, serves to propel them forward ; (in all genuine fishes the tail is placed vertically, whilst in the Animals of the order Cete, it is constantly flat or horizontal;) the *Dorsal* and *Anal* fins assist to steer them laterally ; the *Pectoral*, to elevate or depress them in the water, and when stationary, or at rest, they are sustained by the *Ventral* fins ; many kinds are further aided, in raising or depressing themselves by the contraction or dilatation of the *Air Bladder* ; they are all fur-

nished with *Nictitating Membranes*, by which their eyes are secured from external injury, to which they are particularly subject from the velocity of their motions ; not that we consider their motions comparately speaking, so rapid as those of many kinds of birds ; as a fish when swimming, needs but little exertion to propel it forward, its specific gravity being so near that of the element in which it moves ; whereas, in the flight of a bird, whose specific gravity greatly exceeds that of air, a very considerable expenditure of exertion is necessary, merely to sustain it in air, without assisting to impel them forward.

Most of this class are exceedingly voracious ; they feed on the lesser kinds of fish, moluscæ, aquatic insects, worms, sea weed, and on most kinds of dead carcasses : they are used as food by Man, the larger kinds of birds of prey, the Aquatic Mammaliæ, and Amphibææ. Their increase is astonishingly great, most species are oviparous, but a few produce their young alive.

The migration of Fishes has attracted the attention of Mankind from the earliest ages, and like that of Birds, is attributable to the want of proper places, wherein to deposit their eggs or spawn, or to a dearth of food. Those that spawn early in the year, generally deposit their eggs in shallow waters, where the rays of the sun call them into life ; these, as they advance in age, soon quit the shallows, and finally abandon the shore for the season. The difficulties overcome by various species, when seeking out a place

proper for the support of their future progeny, is almost incredible, some kinds ascend rivers many miles in extent, and in defiance of all obstacles, such as rapid falls, &c., will surmount these, by leaping, or throwing themselves out of the water, frequently many feet high.

Numerous species retire within the Arctic circle on the approach of winter, where, owing to the rigour of the season, their young are less liable to be destroyed by predaceous animals, still here they are not exempt from their attacks, for though miriads of wild fowl quit these inhospitable climes at the Autumnal season, and seek milder climates, yet amidst this region of Ice and Snow, they have their natural enemies to contend with, and guard against : the Polar Bear pursues them even under the ice, and not unfrequently perishes in the pursuit, as in such situations, being unable to take fresh inspiration of air, it soon drowns ; the Walrus, the Manati, the various species of Seals, the endless variety of Gulls, Cormorants, Shags, Penguins, and other piscivorous Birds, are at constant war with, and derive nearly their whole support from this class : add to which, that it is common to many (perhaps most) species, to devour not only others, but also individuals of their own kinds ; the vast encrease of this useful class, is never found to encroach or extend beyond its prescribed limits, so as to inconvenience or intrude upon the other classes.

While the greater number make their brumal retreat to the north, there are others, which not finding their wonted food there, during the winter, repair to the south, and thus

is kept up a constant supply and succession of food to the various animals dependant on them for support. Immense as the quantity is, that is consumed for food by Mankind, a larger number are used for the purpose of extracting oil, or for manure, of some kinds, Man has appropriated every part to some use, as the Cod, whose flesh is eaten, and whose entrails are either applied to the same purpose, or formed into a kind of glue. Of some kinds, only the liver is used to extract the oil, of others, only the skin, as that of the Dog-fish, which is used for smoothing the surfaces of hard wood, and various other substances, answering the purpose of fine files.

Fishes are separated into two divisions, *Bony* and *Cartilaginous*, either of which orders offers an easy gradation from the last order in the class *Amphibia*, as the general appearance of the Snake, Eel, and Lamprey tribes clearly shew.

Bony fishes breath through Gills, covered or guarded by bony plates, which are open on one side, and are dilatible at pleasure, by means of a row of bones situated on the under part; this division contains four orders, the characters of which are taken from the absence, or situation of the Ventral fins.

Cartilaginous fishes have their muscles supported by cartilages, instead of bones, and they breathe through apertures or holes, situated generally on the sides of the neck; they consist of only one order.

DIVISION I. *BONY FISHES.*

ORDER I.

A P O D A L.

VENRTRAL FINS WANTING.

Some of this order are viviparous, and others oviparous ; they are all exceedingly voracious, and many of them are applicable to the purposes of food.

The order contains seventeen genera.

1. *Anguilla*. EEL. *Head* smooth, small ; *nostrils* tubular ; *aperture* to the *gills* small, situated behind the head or *pectoral fins*.

This genus inhabits the ocean, rivers, lakes, and ponds, is very voracious ; all the species are useable as food ; some of the fresh water kinds often quit the water, and may be found wandering in moist meadows.

2. *Muræna*. *Body* Eel-shaped, *pectoral fins* wanting, one *spiracle* on each side of the head.
3. *Synbranchus*. *Body* Eel-shaped ; *pectoral fins* wanting ; *spiracle* placed beneath the neck.

This differs from the preceding genus, in having the

branchial orifice or spiracle, single, and situated beneath the throat.

4. *Sphagebranchus*. *Body* Eel-shaped ; *pectoral fins* wanting ; *spiracles* two, situated beneath the throat.

This differs from the last genus, in possessing two spiracles.

5. *Monopterus*. MONOPTERE. *Body* Eel-shaped ; *nostrils* situated beneath the eyes ; *caudal fin* distinct.

6. *Gymnotus*. GYMNOTE, or ELECTRIC EEL. *Head* furnished with *lateral opercula* ; on the upper lip two *tentacula* ; *gill-membrane*, composed of five rays ; *body* compressed ; in most species the *dorsal fin* is wanting, but such possess a narrow fin beneath.

One of this genus, *G. electricus*, possesses the power of benumbing any animal it comes in contact with, by communicating to it an electric shock ; by the exertion of this power, it stuns such small species as approach it, and then devours them.

7. *Odontagnatus*. *Mouth* furnished with a strong moveable *lamina* or process, on each side of the upper jaw ; *gill-membrane* five rayed.

8. *Comephorus*. *Head* large, with a compressed *snout* ; *mouth* large, with small *teeth* ; *body* elongated, compressed ; the second *dorsal fin* furnished with long naked rays.

9. *Ammodytes*. LAUNCE. *Body* long, enclining to quadrangular; *head* small, slender; *upper lip* doubled in, *dorsal* and *anal fins* extending nearly to the tail; *caudal fin* distinct.
10. *Ophidium*. *Body* ensiform; *head* nearly naked; *teeth* in the jaws, palate, and throat; *gill-membrane* seven rayed.
11. *Triurus*. TRIPLE-TAIL. *Snout* cylindrical; *tooth* single in each jaw; *dorsal* and *anal fins* extending beyond the tail, from which circumstance it has the appearance of possessing three tails.
12. *Leptocephalus*. MORRIS. *Body* compressed, very thin; *head* small, narrow; *pectoral fins* wanting.
13. *Stylephorus*. *Body* long, compressed; *eyes* placed on a short thick projecting cylinder; *snout* protruding, inclining upwards, retractile; *gills* three pair, situated beneath the throat; *pectoral fins* small; *dorsal fin* the length of the back; *caudal fin* short, with spinous rays.
14. *Trichiurus*. *Body* compressed, ensiform; *head* lengthened, the apertures lateral; *teeth* ensiform, hooked, front ones larger: *tail* subulate, without a fin.
15. *Anarhichas*. WOLF-FISH. *Body* long, roundish; *head* blunt; *front teeth* conical, large, divergent; *grinders* large and flat; *gill-membrane* six rayed; *tail fin* distinct.

An exceedingly fierce and voracious tribe, devouring every animal they can master, and often injuring the cables of ships whilst lying at anchor : they are mostly natives of Northern Seas.

16. *Xiphias*. SWORD-FISH. *Body* slender, without scales ; *upper jaw* extending to a great length, hard, slender, pointed ; *teeth* wanting ; *gill-membrane* eight rayed.
17. *Ziphoæa*. SCABBARD-FISH. *Body* compressed, carinated, ensiform ; *head* lengthened ; *eyes* large ; *no true ventral fins*.
18. *Stromætus*. *Body* oval, broad, slippery ; *head* compressed ; *teeth* in jaws and palate ; *tail* forked.
19. *Sternoptyx*. *Body* compressed, without apparent scales ; *head* obtuse ; *teeth* very small ; *aperture* to the gills, oblique, with soft covers.

ORDER II.

JUGULARES.—JUGULAR.

GILLS BONY : VENTRAL FINS PLACED BEFORE THE PECTORAL.

Most if not all the genera in this order are useable as food, they are generally very prolific, and are among the most useful as regards Man. There are seven genera in the Order.

1. *Callionymus*. DRAGONET. *Body* naked : *upper lip* doubled ; *eyes* situated near each other ; *breathing-apertures* on the hind part of the head ; *gill-membrane* six rayed ; *ventral fins* remote.
2. *Uranoscopus*. STAR-GAZER. *Head* large, rough, depressed, lower jaw longer than the upper ; *gill-membrane* with five rays ; *vent* situated in the middle of the body.
3. *Trachinus*. WEEVER. *Head* compressed ; *lower jaws* sloping downwards ; *gill-covers* acculeated, *gill-membrane* six rayed ; *dorsal fins* two ; *vent* situate near the breast.
4. *Gadus*. COD-FISH. *Body* oblong ; *scales* deciduous ; *head* smooth ; *gill-membrane* seven or eight rayed ; *rays* very slender ; *fins* all covered with the common skin ; *ventral fins* slender, ending in a point ; *teeth* in the jaws, and a series of closely set small teeth, in the palate.

This genus stands pre-eminent in point of service to Mankind, it is among the most prolific, as in the roe of the common Cod-Fish, Lewenock is said to have counted upwards of Four Millions Three Hundred and Eighty-four Thousand Eggs ; they are principally confined to salt-water.

5. *Batrachoides*. TADPOLE-FISH. *Head* depressed, very large ; *body* much compressed ; *mouth* wide ; *beard* or *tentacula*, one or more on the lower jaw.

6. *Blennius*. **BLENNY.** *Head* blunt, sloping from the eyes ; *teeth* slender : *body* compressed, smooth, slimy ; *ventral fins* generally composed of two united rays ; *dorsal fin* one ; *gill-membrane* six rayed.
7. *Kurtus*. *Body* carinated on each side ; *back* elevated ; *gill-membrane* two rayed.

ORDER III.

THORACICI.—THORACIC.

GILLS BONY ; VENTRAL FINS PLACED BENEATH THE PECTORAL.

Most of the fishes of this order are useable as food, their increase is great, but not nearly so much so as some of the kinds in the preceding Order ; the majority of them are oceanic, but some few are found in rivers and other fresh waters.

1. *Cepola*. **BAND-FISH.** *Head* short, roundish, compressed ; *teeth* curved, sharp, placed in a single row ; *body* very long and compressed ; *abdomen* extremely short ; *gill-membrane* six rayed.
2. *Gymnetrus*. *Body* very long, compressed ; *teeth* numerous, subulate ; *gill-membrane* four or five rayed ; *anal fin* wanting.
3. *Vandellius*. **VANDEL.** *Body* long, sword-shaped ; *gill-membrane* five or six rayed ; *teeth* subulate, the front teeth longest.

4. *Echineis*. REMORA, or SUCKING-FISH. *Head* furnished with a flat, ovate, transversely sulcated *shield*; *body* without scales; *branchiostegous rays* six.
5. *Coryphæna*. CORYPHENE. *Head* suddenly sloping downwards; *gill-membrane* five rayed; *dorsal fin* extending the whole length of the back.
6. *Macrourus*. IMMENSET. *Head* and *eyes* large; *body* terminating in a long pointed tail.
7. *Gobius*. GOBY. *Head* small; *eyes* contiguous, with two *punctures* between them; *ventral fins* united into the form of a funnel; *gill-membrane* five rayed.
8. *Gobiomorus*. Characters as in the last genus, excepting the *ventral fins* being distinct.
9. *Cottus*. BULL-HEAD. *Head* large, flat, armed with sharp *spines*; *eyes* placed vertically; *gill-membrane* six rayed; *body* lengthened out at the extremity.
10. *Scorpena*. *Head* large, cirrous, aculeated, blunt, without scales; *eyes* approximated; *teeth* in the jaws, palate and throat; *gill-membrane* seven rayed; *dorsal fin* single, long, the anterior rays spinous.
11. *Zeus*. DOREE. *Head* compressed, sloping; *body* deep, greatly compressed sideways; first *dorsal fin* furnished with long slender *filaments* issuing behind each ray of the fin; *gill-membrane* seven rayed.

A very curiously formed genus, all natives of the ocean ; their flesh is in high estimation for the purposes of food.

12. *Pleuronectus*. FLOUNDER. *Head* small ; *body* flat and thin ; *eyes* situated on the same side : *gill-membrane* from four to seven rayed.

This genus, contains a large variety of species, of aspects widely differing, but agreeing in general, habits and œconomy. The genus is divided into such as have their eyes situated on the right side, and others, in which they are placed on the left. The species are generally known by the names of *Holibuts*, *Flounders*, *Soles*, *Plaice*, and *Turbots* ; the flesh of the whole genus is held in high esteem for food ; they all swim edgeways, and generally affect sandy or muddy bottoms, are very voracious, and are mostly caught by the hook and line ; though some of the lesser kinds are taken in nets.

13. *Chætodon*. *Head* and *mouth* small ; *lips* retractile ; *teeth* mostly in a single row, sectaceous, flexile, moveable, equal, closely set and very numerous ; *body* broad, compressed, scaly ; *dorsal* and *anal fins* rigid, mostly spinous ; *gill-membrane* from three to six rayed.

14. *Acanthurus*. *Teeth* small, mostly lobated ; *tail* spinous on each side ; in other respects agreeing with the last genus.

15. *Eques*. KNIGHT-FISH. *Teeth* in several rows ; *body* banded.

16. *Trichopus*. *Body* compressed; *ventral fins* with an extremely long *filament*.
17. *Scarus*. *Jaws* bony, divided in the middle, crenated on the edges; *teeth* connate, and conglomerate.
18. *Sparus*. GILT-HEAD. *Body* compressed; *fore-teeth* sharp; *grinders* flat; *gill-membrane* five rayed; *gill-covers* scaly; *dorsal fin* extending the whole length of the back; *tail* forked.
19. *Gomphosus*. *Jaws* lengthened into a tubular *snout*; *teeth* small, the front ones longer.
20. *Labrus*. WRASSE. *Teeth* conical, long; one *tuberculated bone* in the bottom of the throat, two above, opposite to the other; *dorsal fin* extending the whole length of the back, with a slender *skin* extending beyond the points of each ray; *tail* rounded; *gill-covers* scaly, the *membrane* from four to six rayed.
21. *Ophicephalus*. *Head* covered with dissimilar *scales*; *body* elongated.
22. *Lonchiurus*. The *ventral* placed before the *pectoral fins*, separate; *tail* lanceolate; *head* scaly.
23. *Sciæna*. *Head* covered with scales, which strongly adhere; *teeth* sharp, incurvated; *gill-membrane* generally six rayed, the *gill-covers* scaly; *dorsal fins* two, in some species concealed in a *longitudinal cavity*.

24. *Perca*. PERCH. *Body* covered with rough scales ; *edges* of the *gill-covers* serrated ; *gill-membrane* seven rayed ; *dorsal fins* two, the first *spiny*, the second *soft*.
25. *Holocentrus*. *Gill-covers* serrated, spinous, scaly ; *scales* hard and rough ; in other respects agreeing with the genus *Perca*.
26. *Bodianus*. *Gill-govers* and habits like the last genus ; *scales* smooth.
27. *Scomber*. MACKREL. *Head* compressed, smooth ; *gill-membrane*, seven rayed ; several small, spurious, prickly *fins*, between the *dorsal fin* and the *tail*.

Though not a very numerous family, the individuals of some of the species are almost without number, particularly the common Mackrel, which visits our coasts periodically in such immense shoals, as to afford employment to a very large part of the labouring population, resident on the coasts where these fish are caught ; they appear early in the spring and continue on the coasts during most of the summer months ; the generally received opinion is, that the Mackrel quits our seas during winter ; but this is not satisfactorily proved ; perhaps after spawning, they only quit the vicinity of our shores, and retire to deep water, as repeated instances have occurred of individual fishes being fished up from deep water during the winter season ; in some places these fish are caught by the hook and line, and in others, in nets of very large dimensions ; all the species are gregarious, emit a phosphoric light, and may be eaten with safety.

28. *Gasterosteus*. STICKLE-BACK. *Gill-membrane*, three or six rayed; *belly* covered with bony plates: *dorsal fin* one, between which and the head, are several sharp *spines*; *ventral fins* spinous.
29. *Mullus*. SURMULLET. *Head* compressed, sloping, scaly; *mouth* bearded; *body* covered with large slightly affixed scales, which readily drop off; *gill-membrane* three rayed.
30. *Trigla*. GURNARD. *Head* large, covered with strong bony plates; *nose* sloping; *gill-membrane* seven rayed; *covers* spinous; three slender appendages placed before the *pectoral fins*.
31. *Centorogaster*. *Head* compressed, smooth; *body* depressed, smooth; *gill-membrane* seven rayed; *fins* spinous; the *ventral fins* connected by a *membrane*, with four sharp *spines*, and six soft *rays*.
32. *Trachichthys*. *Head* rounded in front; *eyes* large; *mouth* wide, toothless: *gill-membrane* eight rayed, the four lowermost of which are rough on the edges; *scales* rough, strongly adhering; *abdomen* shielded with large carinated *scales*.

ORDER IV.

ABDOMINALES.—*ABDOMINAL*.

GILLS BONY; THE VENTRAL FINS SITUATED BEHIND
THE PECTORAL.

Most of the Fishes in this Order are Marine, some are found in rivers and lakes, and a few species in ponds; of some of the genera, all the species are applicable to the purposes of food, but of others, many are rejected; we much doubt if any species of fish is of itself poisonous, but may have that effect from feeding on certain kinds of moluscæ, that are deleterious; the roes of several species, in this order particularly that of the BARBEL, are apt to disagree with many persons, on which account they are mostly accounted poisonous. There are Twenty-one genera in the order.

1. *Cobitis*. LOCHE. *Eyes* situated on the upper part of the head; *body* of almost an equal thickness throughout; from the extremity of the upper jaw, protrude several *beard-like appendages*; *gill-membrane* four or six rayed, the *covers* of one piece, closing beneath; one *dorsal fin*.
2. *Anablebs*. *Head* sub-compressed; *mouth* terminal; *teeth* small, situated in the jaws; *eyes* projecting with *double pupils*; *gill-membrane* six rayed.

This is an anomaly among Fishes, as it virtually possesses

four eyes, though but *two orbits*, yet as each is furnished with *two pupils*, the effect must be supposed the same, as if each *pupil* was placed in a separate *orbit*.

3. *Amia*. *Head* flattened, rough, bony, naked; *teeth* numerous, sharp, erect, situated in the jaws, and palate; *cirri* two, placed near the nostrils; *body* scaly; *gill-membrane* twelve rayed.

4. *Silurus*. SILURE. *Head* large, broad, depressed, naked; *mouth* furnished with long *tentacula*; *gape* exceedingly wide, extending nearly the whole length of the head; *body* compressed, elongated, without scales, slippery; *gill-membrane* from four to seven rayed; the first ray of the *pectoral* or first *dorsal fin*, spinous; *spines* recurved.

5. *Platystachus*. *Mouth* beneath, bearded; *body* without scales, depressed; *tail* long, compressed; in general habits and aspect nearly allied to the last genus; like which, all the species are marine.

6. *Loricaria*. *Head* smooth, depressed; *mouth* retractile; *teeth* wanting; *gill-membrane* six rayed; *body* covered with *plates*.

7. *Salmo*. SALMON. *Rays* in the *gill-membrane*, from four to ten; *teeth* in the jaws, and on the tongue; *dorsal fins* two; the hinder one thick, fleshy, and without rays.

All the species are held in high estimation as food ; they are mostly marine, only resorting to fresh waters to deposit their spawn ; in search of situations proper for this purpose, they ascend rivers, particularly such as abound with rapids or falls, to overcome which, they throw themselves out of the water to the height of many feet ; some of the kinds are caught in nets, placed near the falls, and are only accounted in season previous to their shooting (as it is usually termed,) their spawn.

8. *Acanthonotus*. *Body* elongated ; *dorsal fin* wanting ; *spines* on the back and abdomen.

9. *Teuthis*. *Head* truncate ; *gill membrane* five rayed ; *teeth* equal, rigid, placed near together in a single row.

10. *Fistularia*. TOBACCO-PIPE FISH. *Snout* cylindrical ; *jaws* distant from the eyes ; *gill membrane* seven rayed ; *body* round, gradually lessening from the head to the tail.

11. *Essox*. PIKE. *Upper jaw* shorter than the *lower* one ; *teeth* numerous, sharp, placed in the jaws, on the tongue and palate ; *dorsal* and *anal fins*, situated near the tail, and mostly opposite to each other.

A most voracious tribe, feeding on fish, often their own species, are exceedingly destructive to preserves of fish, the great quantity they consume, being but ill repaid by their increase in size, as the large fish are usually coarse, dry, and insipid ; the marine kinds are generally cut to pieces, and used as baits for other fish.

12. *Polypterus*. *Gill-membrane* one rayed ; *fins* numerous along the back.
13. *Elops*. *Head* smooth ; *edges* of the jaws and palate rough, with minute teeth ; *gill-membrane* with thirty rays, armed in the middle of the outer side with five *tooth-like processes*.
14. *Argentina*. ARGENTINE. *Teeth* in the jaws, and on the tongue ; *gill-membrane* eight rayed ; *vent* situated near the tail ; *ventral fins* composed of many rays.
15. *Atherina*. ATHERINE. *Upper jaw* flattish ; *gill-membrane* six rayed ; a silvery line extending along the sides.
16. *Mugil*. MULLET. *Body* and *gill covers*, covered with large scales ; *teeth* on the tongue and palate ; above the angles of the mouth a hard *callous* ; *gill-membrane* with six incurvated rays.
17. *Exocætus*. FLYING-FISH. *Head* covered with large scales ; *gill-membrane* with ten rays ; *pectoral fins* very large and long.
18. *Polynemus*. *Head* compressed, covered with scales ; *snout* obtuse, prominent ; *gill-membrane* five to ten rayed ; *pectoral fins* with distinct, entire, *cirri*.
19. *Clupea*. HERRING. *Head* compressed ; *snout* inclining

upwards; *mouth* rough within; *gill-membrane* eight rayed; *belly* sharp, and in most species serrated.

The Herring tribe afford a very great quantity of food to mankind, and is one of the most abundant and prolific genera; the Herring fishery employing a very considerable portion of the population of such districts as pursue this trade.

20. *Caprinus*. CARP. *Mouth* small; *teeth* situated in the throat; *gill-membrane* three rayed; one *dorsal fin*.

21. *Mormyrus*. *Snout* protruded; *teeth* several, emarginated; aperture to the gills without a cover; *gill-membrane* one rayed; *body* scaly.

DIVISION II.—CARTILAGINOUS FISHES.

ORDER I.

BRANCHIOSTEGOUS.

GILLS WITHOUT BONY RAYS.

In this extensive order but few of the kinds are useable as food, most of them are exceedingly voracious, devouring every animal they can master; they vary greatly in form, and equally so in habits and propensities; the larger part feed on fish, and dead carcasses, others on moluscæ, and sea weed; there are eighteen genera in the order.

1. *Petromyzon*. LAMPREY. *Body* Eel-shaped, slender; *breathing apertures* seven on each side; a fistulous opening on the top of the head; *mouth* situated beneath; *teeth* numerous, placed in circular rows; *pectoral* and *ventral fins* wanting.
2. *Gastrobranchus*. HAG-FISH. *Body* slender, carinated beneath; *mouth* at the extremity, furnished with cirri, and numerous teeth; *eyes* wanting; *tail* surrounded by a soft rayless fin, which extends under the belly; *spiracles* two, situated on the abdomen.
3. *Raja*. RAY. *Body* broad, thin, and flat; *apertures* five on each side, situated beneath; *mouth* beneath, transverse, toothed.

Many of this genus grow to a vast size, they are voracious, and devour animal substances of all descriptions, that fall in their way, they mostly reside at the bottom of the water, and feed principally on other kinds of flat fish; some are applied to the purpose of food; but the flesh of the larger part is rank, ill flavoured, hard, and dry; they are caught by the hook and line, also in nets.

4. *Squalus*. SHARK. *Head* obtuse; *mouth* situated far beneath the end of the nose; *teeth* numerous, moveable, placed in rows; *body* cylindrical, tapering towards the tail; *dorsal fins* two; upper part of the tail longer than the lower; *apertures* five on each side.

This is a very extensive genus, principally confined to the

ocean, and the mouths of large rivers; in many of the warmer countries they are the terror of sailors, their size being frequently so great, as to permit them to swallow an entire human body; and they are so numerous, as to be the constant objects of dread, by the inhabitants of those shores they frequent; the skins of some the kinds are used for rasping and polishing various substances; they are easily caught by the hook and line, baited with any kind of offal.

5. *Pristus*. SAW-FISH. *Snout* long, flat, with spinous projections on the edges; *spiracles* four or five on each side; *mouth* situated beneath, two oval orifices behind the eyes: *ventral fins* approximated; *anal fin* wanting.

6. *Spatularia*. *Mouth* beneath the head, large, furnished with numerous, serrated teeth; *snout* elongated; *spiracle* single, on each side of the neck; in general habits resembling the sharks.

7. *Chimæra*. *Head* pointed on the upper part; *mouth* beneath; *upper lip* five, cleft; cutting *teeth* two, in the front of each jaw,

8. *Accipenser*. STURGEON. *Head* sloping, with a prominent snout; *mouth* placed far below, without teeth; *cirri* between the end of the snout and the mouth; *body* long, angular, with numerous rows of bony plates; *aperture* single on each side.

The flesh of this genus is in great request as food, and all the species produce the substance, known by the name of

Isinglass; but some have it of a very superior quality to others; they are most abundant in northern countries; frequenting the mouths of rivers, particularly at their influx with the sea, they feed on small fish, moluscæ, and insects; they are taken by the hook or in nets.

9. *Lophius*. ANGLER. *Head* and *body* large, flat, circular; *tongue* broad; *teeth* numerous, small, situated in the jaws, tongue, and palate; one breathing aperture behind each *ventral fin*; *pectoral fins* broad and thick.
10. *Cyclopterus*. SUCKER. *Head* obtuse; *teeth* small, sharp, numerous; *gill membrane* with four cartilaginous rays; *body* thick; *back* arched; *ventral fins* united.
11. *Balistes*. FILE-FISH. *Head* compressed, in some species with a spine between the eyes; *mouth* narrow; *teeth* eight in each jaw; of which the two anterior ones are the longest; *breathing aperture* narrow, placed above the *pectoral fins*; *gill membrane* with two cartilaginous rays; *body* compressed, roughened with minute prickles.
12. *Ostracion*. TRUNK-FISH. *Teeth* round, blunt, pointing forwards; *aperture* linear; *body* encased in a complete bony covering; *ventral fins* wanting.
13. *Diodon*. *Jaws* bony, entire; *aperture* of the *gills* linear; *body* covered on all sides with long, sharp, strong, moveable, hollow spines.

14. *Cephalus*. SUN-FISH. *Jaws* strong, bony ; *body* terminating abruptly, as if cut off in the middle ; *dorsal*, *caudal*, and *anal fins* united.
15. *Tetrodon*. *Body* roughened beneath with spines ; *jaws* bony, divided at the point ; *ventral fins* wanting.
16. *Syngnanthus*. PIPE-FISH. *Head* small ; *snout* long, cylindrical, turning up at the end ; *orifice* to the *gills* none ; *breathing aperture* on the hind part of the head ; *ventral fins* wanting ; *body* encrusted with many sided scales.
17. *Centriscus*. *Head* lengthened into a very narrow snout ; *teeth* wanting ; *lower jaw* longest ; *breathing apertures* broad and flat ; *body* compressed ; *ventral fins* united.
18. *Pegasus*. *Mouth* beneath ; *snout* retractile ; *upper jaw* elongated ; *breathing aperture* before the *pectoral fins* ; *ventral fins* behind the *pectoral*.

The numerous families of fishes contribute largely to the comforts and support of Mankind ; and in some countries constitute the principal portion of food ; in civilized countries they are variously applied, in this, and some other nations of Europe, they are among the principal articles exported, either in a dried or pickled state ; the curing of which affords employment to thousands of their inhabitants. The most valuable as articles for exportation, are the Cod, Salmon, and Herring tribes, the two first of which are generally caught by the hook and line, and the latter in nets ;

the common bait for the hook is the entrails of fish or other offal ; which generally answer for most predaceous fishes ; others, particularly the fresh water kinds, are caught with insects, artificial flies, or various preparations of paste ; which can scarcely require repetition in this place.

Fishes, perhaps of all animals, afford last interest in a dry or preserved state ; as they all lose their colours, and mostly their forms ; but for such as will admit of preservation in spirits, the preparation recommended for Lizards, &c., will be found to answer as well as any, and by this mode, their true structure will always be evident ; whereas, in skinning, various curious characters, are either so distorted or destroyed, as to afford only incorrect ideas of their exterior forms ; the great size of numerous species, forbids all attempts at preserving them either entire or skinned ; in every practicable case, the head and gills should be preserved whole, as from these are generally formed the essential, or generic characters.

Such species as cannot conveniently be put into spirits, may be kept for a few days, till putrefaction has commenced, when, by making an incision along one side, the skin will readily slip off ; which may either be dried and placed between paper, or the skin may be stuffed out to its proper extent ; in either case the antiseptic powder should be applied, as recommended for other subjects. A plan has been adopted, which though it represents the subjects of their proper size, still is attended with numerous inconveniences ; it is, that when the skin has been opened, and the flesh all removed, to fill the skin with plaster of Paris ; this will certainly fill out the skin to its proper extent, but the sub-

jects become cumbersome, and of course have an air of excessive stiffness, besides which, many of them lose all their colour ; this latter defect will happen to the skins of almost every kind ; as, soon after death, the vivid tints so attractive during the life of the animal, entirely forsake it, leaving the skins of a dull brown, or olive colour ; to remedy which, the subjects should be stuffed as soon as obtained, and the skins varnished, as early after as it can be done with safety, they being allowed to dry first, otherwise the moisture retained will soon occasion decay.

When finished, the same modes to prevent the attacks of insects should be resorted to, as for the skins of other animals ; and finally they may be placed in cases or cabinets, according to the taste of the collector, securing them from damp, and keeping them rather in a shady aspect, a strong light being likely to induce a change of colour.

On procuring specimens with which the collector may be unacquainted, he should, as recommended in the preceding classes, endeavour to ascertain their useful or noxious properties ; as also, to what purposes applied, whether for food, or other domestic uses ; if the skins or oil be of a nature likely to be of advantage to the Arts or Manufactures ; if used as manure, &c. &c. ; if they be migratory, their kinds of food, and other particulars, which tend to give an insight into the history of the various species.

1815	<i>Memorandum.</i>	<i>Place or resort.</i>	<i>Food, and time of migration.</i>	<i>To what purposes applicable.</i>	<i>Colour.</i>	<i>Colour of eyes.</i>	<i>Length &c.</i>
May 1	Caught this morning in a small clear stream, a very beautiful species, which we learnt only visits this place at stated times, it belonged to order 4. Genus 7. Salmon.	Small rivers and lakes, but only such as are clear.	Insects, worms, small fish, and reptiles; and also on lesser kinds of fish. Quits the shallows of rivers and lakes at the fall of the leaf, and returns early in the year.	The flesh is unusually fine, equal to any fresh water fish, we ever met with.	Reddish silvery brown, with dark spots.	Dark, with yellowish hazel orbits.	23 inches; weight 3 pounds.
June 4	With our net this day, we brought up a kind of fish, of a structure so curious, that we were at a loss whether to consider it as a <i>lurus</i> , or an accidental disfigurement, however on consulting, we found it to belong to order 4. Genus 14. Sun-fish.	This fish is only found in deep water, being entirely marine.	Molluscs and sea weed, no particular times of migration, being occasionally met with at all seasons.	We know of no useful purpose to which this fish is applicable.	Blueish grey above, silvery beneath.	Reddish yellow.	Near 4 inches being 2 feet long and 2 feet 6 inch, deep; weight abt. 20 pounds.
July 2	Hooked a species of Shark, which we observed in numbers, swallowing amazing quantities of small fish and molluscs animals.	Frequent shores of the sea, and mouths of rivers.	Every kind of animal substance it meets with, and can gorge excepting Birds from whence the proverb, "the Shark feeds from a feather." is derived.	The flesh is frequently used as a bait for other fishes, black spots, the skin is requested above, for various mechanical purposes.	Reddish brown, with green, iris, white.	Pupil, sea green, iris, white.	About four feet in length.

CLASS V.

Insecta. INSECTS.

But chief the forest boughs
That dance unnumber'd to the playful breeze,
The downy orchard, and the melting pulp
Of mellow fruit, the nameless nations feed
Of evanescent Insects. Where the pool
Stands mantled o'er with green, invisible,
Amid the floating verdure millions stray.

THOMPSON.

INSECTS, though inferior in bulk, far surpass in variety of forms, beauty of colouring, and singularity of structure, all the larger tribes of Animals; and to those, who like the pious Boyle, can look with an equal eye of admiration on the *Watches*, as on the *Clocks* of Nature, will ever afford objects of delight, wonder and instruction. From their diminutive size, and the small share they appear to have, in furnishing any of the requisite comforts, or contributing to the conveniences of Mankind, the knowledge of them has

not advanced in equal rapidity with that of either of the sister sciences, Ornithology or Botany ; but from the attention now paid to this interesting portion of Animals, this branch of Natural History is fast emerging from that obscurity in which it has been suffered to remain so long.

The prejudice of Mankind, against the study of the more minute parts of the creation is now giving way, being formerly considered as unworthy of attention, on the account of their not contributing to the luxuries or conveniences of life; this contempt, for the *Minutiæ* of Nature, was not confined to the ignorant or uncivilized, but even men of learning and Philosophers treated the study of Entomology, and those who turned their attention to acquire a knowledge of the habits and œconomy of Insects, as fools ; considering that these animals were so contemptable from their size, and of such mischievous habits, as only to be permitted by providence, to exist as instruments for the infliction of punishment, on erring mortals. But as men became more enlightened, the wonders displayed in the varied forms and propensities of these little animals began to be observed, each species was found possessed of proper implements for the supplying of its wants, some were discovered furnished with scoops, others with suckers, by which they were enabled to extract the nectariferous juices of flowers ; many had forceps or saws, by which they separated the particles of their food, too large to be consumed whole ; of the Beetle tribe, divers were observed to bury such substances, as in their fresh state, were too hard for their consumption ; till putrefaction had decomposed their parts, when such as were rejected by the Beetles, offered a delicious repast to the Ant, or other

families of insects, who search for substances of this description, whereon to deposit their eggs; when this wonderful round of œconomy began to be perceived, the subjects of course were considered more worthy of attention, some of the kinds were found to afford a substance capable of being converted into food, as Honey, which was accompanied by another article, also applicable to domestic purposes and Medicine, as Wax; other kinds produced a substance easily converted into clothing, as Silk; others were discovered to afford valuable permanent dyes; and thus by attending to and seeking out those which positively contributed to the luxuries of Man, a knowledge was gained of those kinds which afforded him a sort of secondary assistance.

Of the latter description, some cleared the surface of the earth of fœtid and putrid substances, whilst others performed the same office to the waters, and each was observed to assist in sustaining, and contributing to that beautiful order so conspicuous in the works of their divine creator, who has formed nothing in vain.

The study of this science introduces us to a knowledge of the wonderful œconomy and industry, constantly exerted by the greater part of this large family. The several changes that numerous species undergo, both of forms and manners, previous to their attaining their complete or perfect state, are all subjects of admiration, and render Entomology, one of the most entertaining of the Sciences.

Insects are for the greater part oviparous; the females, guided by unerring instinct, deposit their eggs in situa-

tions affording a sufficient and proper kind of nutriment to the future progeny ; the places where they are deposited, are numerous and varied, and strikingly display the wisdom of their all-wise Creator. Some deposit them on various parts of plants, some commit them to the earth, and others to the waters, some deposit them on putrid flesh, others, on or in the bodies of living animals, even of Insects. After a period more or less short, the *Larvæ* or Caterpillar is hatched, (these differ widely from each other, according to the different tribes or families to which they belong,) and feeding on their predestined food, till they arrive at their full growth, when they change into the *Chrysalis* or Pupa state. In this change, their forms are generally much altered, (and are as various as in the Caterpillar,) during the time they remain in the Pupa, they are mostly inactive, ceasing to feed, and assuming a perfectly torpid appearance, in which they continue, some only a few days or weeks, and others remain dormant for years ; and finally come forth in their perfect or fly state ; when they propagate their species and die.

The following general characters distinguish Insects from other Animals ; they are all possessed of six or more feet ; they respire in a manner entirely different from the larger classes of Animals, which possess lungs or gills, situated in the upper or anterior part of the body ; Insects respire through a sort of spiracula, or breathing apertures, placed in a row on each side, the whole length of their bodies : their skin is externally hard, serving the purposes of bones, of which they have internally none ; to the internal surface of the skin the muscles are affixed, which are more or less

strong in the different kinds, in some, approaching to horn. Besides, the preceding Insects possess some parts which are peculiar to themselves, and are not found to belong to any other description of Animals; as the *Antennæ* or *Horns*, which are situated on the fore part of their heads, and offer a principal distinguishing character, they are jointed and moveable in every part, in which particular they differ from the horns of other animals; that they are organs of sense, is apparent, from their perpetually moving them forward; yet the hard coat with which they are invested, and their extreme shortness in some genera, would induce an idea that they are not the perceptive organs of touch or feeling; the generally received opinion is, that they are the instruments or organs of hearing, but this is not satisfactorily explained; they differ greatly in form, in the different tribes, from which circumstance they offer convenient characters, on which to found the respective genera. The *Palpi* or *Feelers*, are another peculiarity attached to Insects; they are mostly in pairs, in some kinds four, and in others six: they are short, jointed, and moveable, but destitute of the coating or crust observable on the *Antennæ*; they are situated on each side the Mouth.

The Mouth is situated at the fore-part of the head, inclining downwards, in some kinds it is placed quite under the breast, as in the genus *Curculio*: it varies greatly in form; in some of the Beetle tribe, the inner edges are furnished with strongly notched or serrated jaws, having the appearance of teeth, which is also the case with some of the Locusts, and other genera; some tribes possess two, and others four jaws; in a few kinds, the mouth is drawn out to a rigid point: in many

of the Order *HEMIPTERA*, it is bent downward to the breast, as in the genera *Cicada*, *Nepa*, *Notonecta*, *Cimex*, and remarkably in some of the *Curculionæ*. The Tongue in some kinds is taper and spiral, as in Butterflies, in others fleshy and retractile, resembling a proboscis; and in flies it is tubular.

In most Insects the eyes are placed on each side of the head, generally two in number, Spiders have six or eight, and Scorpions six. They possess no eye-brows, but the external tunic of their eyes is hard and transparent, like a Watch-glass; their eyes have no external motion, except in the genus *Cancer*: the eyes in most kinds are compound, at least their exterior coat or cornea is so, which when viewed with a microscope, appears composed of a number of separate hexagonal convex lenses; these have been supposed each to act as a separate eye; yet it is not easy to discover the use of the immense number with which some are provided, as the head of the Dragon Fly is computed to be furnished with not fewer than twenty-five thousand of the separate lenses or eyes. On the top of the heads of many species, are three small, smooth, hemispherical dots or globules, resembling eyes, these are situated between the real eyes, their use and nature is not clearly ascertained, they were called by Linneus *Stemmata*.

Whether Insects are possessed of Brain, continues to be an object of dispute, with the learned, in this branch of anatomical knowledge, however most kinds are furnished with a medulary thread, which passes through their whole extent; but that this is analogous to the brain and spinal

marrow in the larger animals, we are inclined to doubt, as it may be separated, the head removed, and the animal will still continue to live, to run, and even copulate ; some kinds have been known to live for days without their heads. The formation of Insects is so peculiar to themselves, that we have no parallel in any of the other classes. Some of the animals in the class *Vermes*, may be cut and divided almost *ad infinitum*, and each part will eventually become a perfect animal ; some insects, without this reproductive power, will bear dividing, and still continue to live, and perform most of the various functions with which they are endued : the common Dragon Fly, (*Libellula varia*) will live for days without its head ; and if instead of the head, the abdomen be taken away, the animal seems to suffer no material injury, as it continues to feed, run, and fly, nearly as usual, the latter function is but awkwardly performed, but if in lieu of the real abdomen, a piece of straw, paper, or any substance that will restore the proper balance be affixed to the thorax, the animal flies with its usual alacrity, and has been known to survive some days in this state. This Insect is of a very voracious nature, and has been known to feed under circumstances, that had we not authority for repeating them, we should not have ventured on the following account. * A gentleman being engaged in collecting Insects, caught a specimen of the common Dragon-Fly, which he fastened down in his collecting box, with a large pin thrust through its thorax ; when, to his astonishment, he observed the Dragon-Fly held in its forceps a fly, which was still struggling for liberty, this it soon devoured, without exhi-

* Philosophy of Natural History, by Charles Fothergill.

biting any signs of pain, seeming wholly unconscious of its own unpleasant situation, being still secured by the pin before-named, to a piece of cork ; when the fly was devoured, the insect began to flutter, and made several attempts to regain its liberty ; the gentleman, greatly surprised at this incident, and willing to prove the experiment still further, caught another fly, which he offered to it, this was eagerly seized by the rapacious animal, and devoured with greediness, and when its meal was finished, it began to flutter again as before.

We do not repeat this anecdote with a view to encourage or palliate cruelty to Insects, but merely adduce the fact, in opposition to the generally received opinion of the susceptibility of this class of animals. It certainly is not derogating from the benevolence so conspicuous in all the works of Providence, to conceive it probable, he has with infinite wisdom withheld from some of the lower classes of Animals that degree of sensation so abundantly dispensed to others filling the higher ranks of creation ; as from the habits necessarily entailed upon them, they are more likely to encounter accidents that tend to mutilate, than other individuals of higher powers of sensation : thus we often see (an animal belonging to the next order, or lower scale of creation,) the common Earth-Worm, an object of contention between two birds, neither of which being willing to part with its prize, in the scuffle the worm is frequently separated into three parts, each of the birds flying away with an extremity, and leaving the centre portion of the animal behind ; which, if the situation where it is left be moist and sheltered, in a few days begins to repair its loss, and in a short time restores its

deficient parts ; or if a worm be divided in two pieces they will each in a short time, under favourable circumstances become perfect animals.

Now Insects, the constant food, and the objects of almost unremitting search, by such a great variety of animals; had they the feelings supposed generally to exist in all animated bodies, their lives must be a continued round of pain and watchfulness ; not that we conceive it probable they are entirely destitute of feeling, but their sense of pain is so far blunted, as not to be of that nature generally understood by the term. That it is consistent with the beneficence of Almighty wisdom, that these his creatures should experience pleasure, we feel convinced ; and with that mercy so benevolently extended to all his works, has kept them from experiencing those painful sensations which their rank in creation would subject them to, if possessed of the sensibility so evident in the Mammiferous Class.

Insects not being possessed of any external organs, adapted for the purpose, are considered as incapable of hearing, yet they are sensible of any loud or shrill sound ; whether they are endued with the sense of smell is equally doubtful, no organ being found likely to answer that purpose, nevertheless they perceive, agreeable or fœtid effluvia, but in a manner we are entirely unacquainted with.

These animals are composed of three parts ; the head, thorax, and abdomen : the head is placed at the anterior part of the body, and is joined to the thorax or trunk, which has the legs inserted into it ; that its parts may

be distinctly determined, it is divided into Thorax, Scutellum, and Sternum. The Thorax is various in its shape, as is the back or upper part of the breast or Sternum. The Scutellum is the posterior part of the Thorax, frequently of a triangular shape, and is divided from the Thorax by a suture, very conspicuous in many of the Coleopterous Insects.

The Abdomen is the posterior part of the body, and is composed of a number of annular sections or rings, which serve to contract or lengthen it as occasion may require; the last joint terminates in the tail. The Spiracula or Breathing apertures, are situated on each side of every segment or articulation of the abdomen, and if these be closed with oil or other unctious substance, it mostly proves fatal to them: as before observed, some particular kinds will survive days after this part is entirely removed, yet in these, if the spiracula be stopped up, they soon expire.

The limbs of Insects consist of three principal divisions; the first or upper joint Femur or Thigh; the second joint Tibia or Leg; the third, which consists of several articulations, is called Tarsus or Foot; and in some kinds the foot is furnished with Unguis or Claws, which are mostly double. Most of those Insects included in the Order Diptera, are possessed of two small protuberances or bladders, one situated under each wing, which are termed Halteres or Poisers, and are supposed to assist in balancing the Insects in their flight.

The larger number of Insects are annual, their whole life terminating in the space of one year or less; many not sur-

viving half that time, and some few live in their complete or Fly-state only a few hours. The metamorphosis, that all excepting the Apterous Order are continually undergoing, renders this science more complex than most others that relate to Natural History: the Larvæ or insect as soon as excluded from the egg, is exceedingly voracious, and for the most part when at its full growth is much larger than the mature insect; the Pupa or Chrysalis, except those of the order Hemiptera, take no nourishment; the Imago, or perfect state, is the third and last change the Animal undergoes, when it appears in its proper shape and colours, in this state it attains wings, is capable of propagating its species, and acquires its true Antennæ, which in the previous states were hardly apparent or wanting.

Insects are divided into seven distinct orders, the characters of the first six are drawn from the texture and number of their wings, and the seventh from their being destitute of wings.

ORDER I.

COLEOPTERA.

To most of the individuals of this extensive order the term Beetle is applied in common language, though scientifically it is confined to the first genus. All the species are furnished with thin membranaceous wings, covered by a pair of strong horny coverings, or shells. The order consists of thirty-two genera.

1. *Scarabæus*. BEETLE. *Antennæ* or *horns* clavate, the *tips* lamellate. Plate 3, fig. 1. *Legs* generally toothed ; *body* thick and compact.

The Larvæ or grubs of this genus have six feet ; they generally live under the ground, and feed on the roots of grass and vegetables, and on the excrements of Animals ; in the fly state they devour the foliage of trees, decaying wood, and various putrid and fœtid substances.

2. *Lucanus*. STAG-BEETLE or CHAFFER. *Antennæ* clavate, *tips* compressed, divided into lamellæ on the inner side, Plate 3, fig. 2. *jaws* projecting beyond the head, toothed.

In the grub state this genus is usually found in the hollows of decaying trees, feeding on the finer parts of the wood. The common Stag Beetle, *L. Cervus*, is frequently seen in this country, and is the largest of the European Coleopterous Insects.

3. *Dermestes*. LEATHER BEETLE or CHAFFER. *Antennæ* clavate ; *tips* perfoliate, the three last joints larger than the others ; Plate 3, fig. 3. *thorax* convex, slightly margined ; *head* retractile, or capable of being withdrawn beneath the *thorax*.

This genus usually abounds in furs, skins, and other dry animal substances, and are particularly injurious to collections of Natural History.

4. *Plinus*. *Antennæ* filiform, the three last joints longest Plate 3, fig. 4. *thorax* roundish, without any distinct margin ; *head* retractile.

This like the preceding genus, consists of small animals, but they are gifted with very destructive appetites ; some of the species in their larva and perfect state live in dry animal substances, others in old wooden furniture, or amongst books or papers, which they injure by innumerable perforations.

5. *Hister*. *Tips* of the *Antennæ* nearly solid, the lowest joint compressed and decurved, plate 3, fig. 5. ; *head* retractile ; *mouth* furnished with forceps ; *wing-covers* shorter than the body ; *fore legs* toothed.

6. *Gyrinus*. GLIMMER-CHAFFER. *Antennæ* clavate, stiff, shorter than the head, : plate 3, fig. 6. ; *eyes* four, two situated above and two beneath the base of the antennæ.

This is an aquatic genus, and in common with all the water Beetles, fly only at night.

7. *Pausus*. *Antennæ* of two joints, the upper very large, inflated, hooked, moveable ; plate 3, fig. 7 ; *head* projecting ; *wing-covers* flexile, deflected, truncate.

8. *Byrrhus*. *Antennæ* clavate, nearly solid, compressed, plate 3, fig. 8.

Some of the species frequent houses, and are equally injurious to furniture and collections, with those of the genus *Dermestes* ; others frequent gardens, and may be found crawling about the stems and leaves of plants.

9. *Silpha*. CARRION BEETLE. *Antennæ* thickening towards the tip; *wing-covers* margined; *head* prominent; *thorax* flattened, margined.

This genus, as its name imports, resides and feeds on decaying animals, as also under the rotting bark of trees.

10. *Cassida*. *Antennæ* moniliform, fig. 9, plate 3; *thorax* and *wing-sheaths* margined; *head* concealed beneath the projecting shield of the *thorax*; *body* oval, convex, beneath flat.

Most of the species attach themselves to the leaves of plants, and may be met with in tolerable abundance in gardens, during the summer months.

11. *Coccinella*. LADY-BIRD. *Antennæ* clavate; *tips* solid; fig. 10, plate 3; *palpi* four, the anterior two, hatchet shaped, the posterior ones filiform; *body* hemispherical; *abdomen* flattened.

This elegant genus feeds on that destructive tribe of insects, the *Aphides* or plant lice.

12. *Chrysomela*. *Antennæ* moniliform, thickening towards the tip; *palpi* six; *thorax* margined; *body* ovate, or oblong, convex.

A very beautiful and numerous tribe, some of the individuals may be found in almost every wood or garden; both the larvæ and mature insect feed on the leaves of plants.

13. *Hispa*. *Antennæ* spindle shaped, fig. 11, plate 3, approximated at the base, growing between the eyes; *thorax* and *wing-covers* mostly spiny.
14. *Bruchus*. *Antennæ* filiform; *head* retractile; *thorax* lengthened forwards; *wing-covers* truncated, shorter than the body.
15. *Curculio*. WEEVIL. *Antennæ* clavate; *tips* in some species bifid, fig. 12, plate 3, situated on the *snout*, which is horny and prominent.
- This is a very splendid tribe, the larvæ of some infest granaries, others may be found inside of Artichoke and Thistle flowers; the whole genus feeds on the seeds or leaves of vegetables; one of the most common is *C. nucum*, the Nut Weevil, to this genus also belongs the insect generally known by the name of Diamond Beetle.
16. *Attelabus*. *Antennæ* moniliform, thicker towards the *tips*; fig. 13, plate 3, placed on the *snout*; *head* pointed behind.
17. *Cerambyx*. *Antennæ* slender, joints longish; fig. 14, plate 3; *thorax* spinous or swollen; *wing-covers* linear; *body* oblong.

Most of the *Cerambyces* in the grub state, reside in the hollows of decaying trees, on the substance of which they feed, they nearly resemble the larvæ of the Scarabæ. In the fly state, many of them possess a great

degree of beauty, they are exceedingly numerous, and though the general formation of the antennæ are the same throughout, in some species they are *short*; that is, not of equal length with the body; in others, they are termed *moderate*, or of the same length as the body, and *long*, when their length exceeds that of their bodies.

18. *Leptura*. Antennæ setaceous, composed of an indefinite number of spherical joints; fig. 15, plate 3; *wing-covers* tapering towards the *tips*; *thorax* slender, rounded.
19. *Necydalis*. Antennæ setaceous; *wing-sheaths* smaller, shorter or narrower than the wings or abdomen; *tail* entire.
20. *Lampyrus*. FIRE-FLY, or GLOW-WORM. Antennæ filiform, in some species pectinated, in others plumose on one side, fig. 17, plate 3; *wing-covers* flexible; *thorax* flat, semi-orbicular, surrounding and concealing the head; *abdomen* having the sides plaited into papillæ; in most species the females are wingless, and emit a feint light.
21. *Cantharis*. Antennæ setaceous, or filiform; *thorax* margined, usually shorter than the head; *wing-covers* flexible; *abdomen* plaited into papillæ on the sides.

The insects in this genus are generally voracious, feeding on other insects, some few devour the leaves and stems of plants; our native species may be found during the warm summer months, on the stems of plants.

22. *Elator*. *Antennæ* setaceous, or pectinated, in some species assuming a fan-like appearance, fig. 18, plate 3, protruding from a groove beneath the head; *body* oblong, the under side of the *thorax* terminating in an elastic *spine*, placed in a cavity of the *abdomen*: by means of this apparatus, the insect, when placed on its back, springs up and recovers its natural position.
- 23 *Cincidella*. *Antennæ* setaceous; *jaws* prominent, toothed; *eyes* projecting; *thorax* roundish, margined.

Most species in this genus are extremely ferocious, devouring all other insects that they can overcome; their usual haunts are dry meadows, and sandy banks; and are only to be seen on wing during the hottest part of the day, while the sun shines. Their larvæ lurks in holes in the sand, and like the perfect insect, devours whatever insects it overpowers.

14. *Bupertris*. *Antennæ* slender, serrated, the length of the *thorax*; *head* partly hid beneath the *thorax*.

This is a most brilliant genus, many of the species rivaling in brilliancy the most highly polished gold or copper, they feed on vegetable substances; their larvæ is found in decaying trees, and in timber.

25. *Dyticus*. *Antennæ* setaceous; *hind-legs* hairy, formed for swimming, and terminated by very minute claws.

The whole of this genera are aquatic.

26. *Hydrophilus*. *Antennæ* clavate, perfoliate, fig. 19, plate 3; *hind-legs* as in the last genus.

The insects of this and the preceding genus, are inhabitants of ponds, and stagnant waters; they swim with great dexterity; their hind legs are particularly fitted for their residence in the water, being thin and flat, and having the inner edges furnished with stiff hair-like appendages, which act as fins or oars; the males are distinguished from the females, by having a horny flap or shield on the fore legs, near the setting on of the feet. The larvæ, (as is common with aquatic insects,) remain a long time in the imperfect state, some two to four years; they secrete themselves in holes in banks, and devour other insects, worms, and the young fry of fish: which they destroy by sucking out their juices.

27. *Carabus*. *Antennæ* setaceous; *thorax* flat, subcordate, margined; *wing-covers* margined; *abdomen* ovate.

A numerous tribe of insects, exceedingly active; they devour the larvæ, and likewise all other insects they can overcome; their larvæ are found under-ground, or in decaying wood.

28. *Tenebrio*. *Antennæ* moniliform, having the last joint rounded, fig. 20, plate 3; *thorax* plano-convex, margined; *head* projecting; *wing-covers* stiffish.

29. *Meloe*. *Antennæ* moniliform, the last joint ovate, fig. 21, plate 3; *thorax* roundish, *wing-covers* soft, flexible; *head* inflected.

30. *Mordella*. *Antennæ* knotty, with small hook-like projections from some of the joints ; fig. 22, plate 3 ; *head* incurved ; *feelers* compressed, clavate, obliquely truncate ; *wing-covers* curving downwards towards the tip ; *lamina* broad, situate at the base of the abdomen, and before the thighs.
31. *Staphylinus*. *Antennæ* moniliform ; *wing-covers* half the length of the body ; the *wings* folded up and covered by the *sheaths* ; *tail* simple, furnished with two exsertile *vesicles*.

These are a very rapacious tribe, devouring all kinds of insects, they can catch or master, and frequently one another ; they also feed on earth-worms and slugs, and most kinds of putrid substances ; their usual haunts are damp loathsome places, and sometimes they may be found on such plants as emit a fœtid smell, or are of a dark lurid colour.

32. *Forficula*. EAR-WIG. *Antennæ* setaceous ; *wing-covers* half the length of the abdomen ; *wings* hid by the covers ; *tail* armed with forceps.

This genus frequents moist ground, are very injurious to flowers and fruit, and may easily be taken by suspending any hollow substance on a plant or twig, as they retire in the day time to such retreats, and feed mostly during the night.

ORDER II.

HEMIPTERA.

The individuals of this order are all furnished with wing covers of a softer texture, than those of the preceding; these covers do not meet in a direct line, as in the Coleoptera, but the base of the left wing covers the inner margin of the right; in some, the wings nearly cross at the tips; the mouth is either situated on the breast, or inclining towards it.

1. *Blatta*. COCKROACH. Head inflected; antennæ setaceous, and entire; plate 3, fig. 23; or setaceous and jointed, plate 3, fig. 24; wings and wing-covers flat, smooth, subcoriaceous; thorax flattish, orbicular, margined; feet formed for running; abdomen terminating in two or four spines.

Many of this genus are exceedingly injurious, devouring most kinds of provisions, paper, leather, and vegetable substances; they are generally nocturnal insects, and are found in great abundance in bake-houses, and other warm places. They are all killed without any external injury, by emersion in boiling water.

2. *Mantis*. Head unsteady; mouth furnished with jaws and feelers; antennæ setaceous; thorax linear; wings four, membranaceous, convoluted; the lower pair plaited; fore-legs compressed, serrated beneath;

armed with a single *claw*, and lateral jointed *foot* ; *hind-legs* smooth, formed for walking.

The insects of this genus are of the most curious forms, some resembling leaves of plants, and others, of shapes so strange, as to appear to be composed of parts of various insects.

3. *Phasma*. Head large ; *antennae* filiform ; *eyes* small rounded ; *stemmata* between the eyes ; *wings* four, membranaceous ; the upper pair short ; the lower, plaited ; feet formed for walking.

4. *Gryllus*. Locust. Head inflected ; furnished with *jaws* and *palpi* ; *antennae* filiform, or setaceous ; *wings* four deflected, convoluted ; the lower pair plaited ; *hind-legs* formed for leaping ; *claws* double on all the feet.

In some of the warmer countries, this genera of insects are, of all the pests that mankind are subject to, the most injurious, destroying vegetables of every kind, and even from their numbers alone, constituting one of the heaviest afflictions that can happen to a country. The mischiefs done by the *Blattæ* or Cockroaches, is trifling, compared with those of this destroying tribe, as the dreadful ravages committed by the Locusts, are such, as to reduce the most fertile fields, to the appearance of barren deserts ; they devour the fruits, leaves, and even the buds and bark of trees ; and have even been known to devour the reeds used in thatching the habitations of the natives, so unfortunate as to be visited by these devouring hordes. Most of the species possess

either a considerable degree of beauty in colour, or singularity of form, and are much sought after by collectors, they may be destroyed without injury to their external appearance, by emersion in boiling water. Some of the species are eaten as food, by the inhabitants of the east.

5. *Fulgora*. LANTERN-FLY. Head projecting, hollow, inflected; *antennæ* short, consisting of two joints; *snout* inflected; *feet* formed for walking.

This is a very singular genus, and are generally discoverable from the light they emit.

6. *Cicada*. *Snout* inflected; *antennæ* short, setaceous; *wings* four, membranous, and deflected; *legs* in most species formed for leaping.

This genus of insects, feed on various kinds of plants; the grub or larvæ, is without wings; in the *pupa*, the wings are very short; but in both states they are exceedingly active. The males are distinguishable by their loud chirping note, the females are quite mute. In the fly state, they are found on the leaves and stems of plants, and in the immature states, about the roots of grass and trees.

7. *Notonecta*. *Snout* inflected; *antennæ* shorter than the thorax; *wings* four, coriaceous on the upper half, and crossed over each other; *hind-legs* hairy, flat, formed for swimming.

This is an aquatic genus, residing in stagnant waters, and

devouring small insects, and animalculæ; like the preceding, the *pupa* has the rudiments of wings, but the *larvæ* is apterous.

8. *Aepa*. WATER-SCORPION. *Snout* inflected; *wings* four, cross-wise, coriaceous on the upper parts; *fore-feet* formed for swimming; the others for walking.

An aquatic genus, agreeing in habits with the preceding.

9. *Cimex*. BUG. *Snout* inflected; *antennæ* longer than the thorax; *wings* four, folded, the upper pair coriaceous at their bases; *back* flat, with the *thorax* margined; *legs* formed for running.

10. *Aphis*. PLANT-LOUSE. *Snout* inflected; *antennæ* longer than the thorax; *wings* either four, or wanting; *feet* formed for walking; *abdomen* mostly furnished with two horns or processes.

There are but few plants that are not subject to the attacks of this minute tribe of animals; they frequent the leaves, stems, young stalks, and buds of plants, and trees: their æconomy was formerly little understood, but the late Mr. William Curtis, who made this curious family his particular study, has, in a paper published in the sixth volume of the Linnean Transactions, given their history, which is replete with highly interesting information. In this place we shall merely remark, that at an early period of the year, the young are produced alive, at another time, from an egg, and that the female once impregnated, continues to pro-

duce many successive generations, without further sexual intercourse: some of both sexes are winged, and others, without wings.

11. *Chermes*. *Snout* situated on the breast; *antennæ* longer than the thorax; *wings* four, deflected; *thorax* gibbous; *feet* formed for walking and leaping.

This genus like the preceding, inhabits the leaves and stems of plants, and by their punctures, produce excrescences and protuberances of various sizes and shapes, which are generally found to enclose either the egg or immature insect, in the larvæ state, it is six footed, and without wings; and in the pupa, are two protuberances from the thorax, which are the rudiments of the future wings.

12. *Coccus*. COCHINEAL-INSECT. *Snout* pectoral; *antennæ* filiform; *abdomen* bristly behind; wings in the male, two, upright; in the female, wanting.

This tribe of insects abound in warm countries, and in England, are met with in great numbers, in hot and green houses, where they are exceedingly troublesome; the males are active, but the females are very inert, being generally fixed to different parts of plants. It is from a species of *Coccus*, that the colour so celebrated for its brilliancy, *Carmin*e is extracted.

13. *Thrips*. *Snout* secreted within the mouth; *antennæ* the length of the thorax; plate 3, fig. 25; *body* linear; *abdomen* inclining upwards; *wings* four, strait, long,

Incumbent on the back, narrower than the body, slightly crossing.

ORDER III.

LIPEDOPTERA.

This order contains the most splendid of the Insect tribes, it is divided into three genera; they all possess four farinaceous wings, covered with very fine scales, laid one over another; tongue spiral. The changes that this order undergo, we have particularly noticed in our introduction to the class.

1. *Papilio*. BUTTERFLY. *Antennæ* thickening towards the extremity; fig. 27, plate 3, generally terminating in a knob, or club-shaped tip: *wings* when at rest, usually elevated, and meeting at the edges; all this genera fly during the day.
2. *Sphinx*. HAWK-MOTH. *Antennæ* thickest in the middle, fig. 28, plate 3, and pointed at the extremity; *wings* deflected: most of this class fly either in the morning or evening.
3. *Phalænæ*. MOTH. *Antennæ* setaceous, plate 3, fig. 29, in some hairy, fig. 30, or pectinated, fig. 31, gradually lessening from the base to the tip; *wings* mostly deflexed when at rest; flight nocturnal.

ORDER IV.

NEUROPTERA.

This order is distinguished by possessing four transparent reticulated wings, and the tail being unarmed ; most of the insects in this family are aquatic, residing in the water during their immature state, and resorting thereto in their perfect state.

1. *Libellula*. DRAGON-FLY. *Antennæ* short ; *mouth* furnished with several jaws ; *wings* expanded ; *tail* terminated in the male insect by a forked process.

This genus is very voracious, they are found flying over, or in the vicinity of stagnant waters ; their *larvæ* is six footed, very active, and ferocious, furnished with an articulated forcipated mouth ; the *pupa* resembles the *larvæ*, but has the rudiments of wings ; they feed on aquatic insects, and when mature on any winged insect they can overcome, generally taking their prey on wing.

2. *Ephemera*. DAY-FLY. *Mouth* without teeth or feelers ; *stemmata* two, very large, situated above the eyes ; *wings* erect, the upper pair considerably the largest ; *tail* terminating in long hair or bristles.

In the mature state, this is one of the shortest lived animals, seldom surviving more than a day, in some species but

a few hours, and in others, less than one hour, during which time they propagate their species, and die.

They are all aquatic insects, in the imperfect state, like the preceding, living entirely in the water; the larvæ is six footed, active, is tailed, and is greedily devoured by trout, and other fish; possesses lateral processes, or fins; the *pupa* resembles the *larva*, except possessing the rudiments of the future wings.

3. *Phryganea*. Mouth without teeth; feelers four; *stemmata* three; *antennæ* setaceous, longer than the thorax; wings equal, incumbent, the lower pair plaited.

The individuals of this genus bear a considerable resemblance in their adult state, to some of the *Phalenæ*, but are distinguishable by their not possessing the spiral tongue: the larvæ is six-footed, and resides at the bottom of shallow waters, in a case, composed of small pieces of straws, which are glued together by an exudation from the insect, the case is tubular; lined with silk-like filaments, and is open at each end; they feed on aquatic insects, the spawn of fishes, as also on the young fry.

4. *Hemerobius*. Mouth furnished with two teeth; palpi four; *stemmata* wanting; thorax convex; *antennæ* longer than the thorax, in some species setaceous; in others, pectinated on one side; fig. 31, plate 3; wings deflected, smooth, not plaited.

The eggs of these insects are of a highly curious structure,

being supported on a delicate stem, sometimes of half an inch in length, they are usually attached to the leaves of plants, from these eggs the larvæ are shortly excluded, they are of an ovate form ; some kinds being hairy ; they possess six legs, and feed on the Aphides, or plant lice ; the pupa is enveloped in a silkened case in its dormant state ; the fly greedily devours the aphis, is very short lived ; and when bruised, emits a very strong unpleasant odour.

5. *Myrmeleon*. Mouth furnished with jaws ; *stemmata* wanting ; *antennæ* clavated, the length of the thorax ; fig. 32, plate 3 ; *wings* deflected ; *tail* of the male armed with *forceps*, consisting of two straitish filaments.

Larva six-footed, ovate, hairy, with exerted toothed jaws ; in this state, it preys with great ferocity on ants, and small insects, to ensnare which, it forms a kind of pit-fall in the sand, under which it retires till aroused by the falling of the sand, when it rushes out and eagerly seizes the unfortunate intruder : the pupa is enclosed in an agglutinated ball of sand or earth, lined with a silky web : in this state it remains about four weeks, when the perfect fly comes forth, which greatly resembles some of the smaller *Libellulæ* but is easily distinguished by its *antennæ*.

6. *Panorpa*. Snout lengthened into a cylindrical horny proboscis ; *feelers* two ; *stemmata* three ; *antennæ* longer than the thorax ; *tail* in the male, clawed.

7. *Raphidia*. Head depressed, horny ; *mouth* with two teeth ; *thorax* long, cylindrical ; *stemmata* three ;

feelers four ; *wings* deflected ; *antennæ* the length of the thorax ; *tail* of the female terminated by a long recurved bristle.

8. *Termes*. *Mouth* with two jaws ; *antennæ* setaceous ; *eyes* two ; *wings* in males and females, but wanting in the neutrals ; *legs* six, formed for running.

The labours of the Termites, or White Ant, far surpass in extent and ingenuity, either the industry of the Bee, or the Beaver ; and the mischief they do to mankind is of so serious a nature, that scarcely any substances, but metal or stone, can resist their attacks ; as they completely destroy in a single night, every article of wooden furniture, clothes, books, or leather, in a room, frequently not sparing either the floor or wainscot ; fortunately the temperate climes of Europe are not visited with these pests, but in all the tropical climates, they are very abundant, those that are natives of England, are generally found in woods, and particularly at the fall of the year, they may be met with on the trunks of large trees. For an interesting account of the mischiefs occasioned by these insects, see Mr. Smeathman's account published in the Philosophical Transactions.

ORDER V.

HYMENOPTERA.

Many of this order of Insects in appearance bear a strong resemblance to some of the preceding, but may be mostly distinguished by their possessing a sting, which is not always

venomous, but is used to pierce holes in substances proper for the nourishment of the young; when they have pierced the holes, they immediately deposit an egg therein. They all possess four membranaceous wings.

1. *Cynips*. GALL-FLY. *Mouth* with jaws; *antennæ* moniliform; *sting* or *piercer* spiral, in some species concealed in the body.

The excrescences so common on many vegetables, and known by the name of *galls*, are produced by the puncture of these insects; the larvæ is soft, cylindrical, without feet; and inhabits the galls, feeding on juices of the tree; the pupa resembles the perfect fly, except in having only the rudiments of wings.

2. *Tenthredo*. SAW-FLY. *Mouth* with jaws; *wings* tumid, flat; *sting* composed of two serrated laminæ, which are nearly secreted.

The larvæ of some of the species in this numerous genus, bears a strong resemblance to some of the caterpillars of the *Lipodopterous* Insects: but are distinguishable by the number of the feet, which are never fewer than sixteen, exclusive of the thoracic pairs; the larvæ feed on the leaves of plants, and the pupa is enclosed in a strong gummy case, retiring in the autumn, and the perfect fly emerges early in the ensuing spring. The serrated sting is used by the female in the manner of a saw, to make incisions in the twigs or stems of plants, where it deposits its eggs.

3. *Sirex*. Mouth furnished with two strong jaws ; feelers two, truncated ; antennæ filiform, with more than twenty-four joints ; piercer exerted, stiff, serrated ; abdomen sessile, pointed ; wings lanceolate, flat, the lower pair shorter.
4. *Ichneumon*. Mouth with jaws ; tongue wanting ; antennæ setaceous, with more than thirty joints ; abdomen sessile ; piercer with a cylindrical exerted bivalve sheath.

All these animals deposit their eggs in the bodies of living Insects ; the larvæ feeding on the juices of the unfortunate animals, but not affecting the vital parts, so that they are constantly supplied with proper nutriment ; generally turning into the Chrysalis state, previous to the death of the insect on which they were hatched.

5. *Sphex*. Mouth with jaws ; tongue wanting ; antennæ of ten joints ; wings flat, incumbent, not plaited, (in each sex ;) sting venomous, concealed in the abdomen.

The females of the last genus deposit their eggs in the bodies of living animals ; by this, the eggs are deposited in the bodies of dead ones ; by means of their sting they overcome insects otherwise too large for them to master ; they are very savage and rapacious, preying on any insects that are so unfortunate as to come in their way ; the larvæ is footless, and the pupa possesses the rudiments of wings.

6. *Chrysis*. Mouth with jaws ; antennæ filiform with the first joint lengthened, the remaining eleven, short ; fig.

33, plate 3; *abdomen* arched beneath, with a lateral scale on each side; *tail* toothed; *sting* pungent, nearly concealed; *wings* flat. *Body* with golden and prismatic reflections.

7. *Vespa*. WASP. *Mouth* with jaws; *antennæ* filiform, the first joint longer, and cylindrical; fig. 34, plate 3; *eyes* lunated; *body* smooth; *sting* concealed; *upper wings* plaited.

The species of this genus mostly live in societies, constructing cellular nests or combs, generally under ground, in a hole in a sloping bank, or beneath the roots of trees, they feed on flies, bees, and other insects, on flesh, meal, fruit, and sweet substances; the larvæ is soft, without feet, and feeds on honey.

8. *Apis*. BEE. *Mouth* furnished with jaws, and an inflected *proboscis*, with two bivalve *sheaths*; *wings* flat, with out folds; *sting* in the female and neuter insects, concealed: the male is without sting.

The æconomy of some of this tribe is so generally known, as to render any detail unnecessary in this place, it may be sufficient to say, that most of the species live in large societies, in nests, composed of waxen cells; some few are solitary; they feed on honey, and the nectariferous juices of flowers and fruit; the larva is soft, and without feet; the pupa resembles the perfect insect.

9. *Formicula*. ANT, or EMMET. *Head* large: *antennæ*

filiform, defracted; *mouth* with large jaws; *feelers* four, unequal; *thorax* narrow behind, with a small upright scale between it and the abdomen, which is nearly round; females and neuters furnished with a concealed *sting*. Males and females winged, neuters without wings.

This genus of insects is proverbially industrious, and like the two preceding genera, is composed of males, females, and neutrals, they live together in large societies, and from the depredations they commit in many of the warm countries, are objects of considerable dread. They feed on animal and vegetable substances, and are particularly fond of sweets, the larvæ are without feet; what are generally termed Ants eggs, are the insects in the pupa state.

10. *Mutilla*. *Antennæ* filiform, in some species sickle-shaped, fig. 36, plate 3; *thorax* downy, retuse behind; *wings* wanting in most species; *sting* concealed.

These insects nearly resemble the Ants, living in a similar manner, and nearly corresponding in general habits.

ORDER VI.

D I P T E R A.

This order is distinguished from the foregoing, by possessing only two wings, under each of which is placed a small protuberance or poiser, with a small projecting scale.

1. *Oestrus*. GAD-FLY. *Antennæ* three jointed, the middle one globular, short, deeply seated; fig. 37, plate 3; *face* broad, depressed; *mouth* a simple aperture not projecting; *feelers* two, sunk two-jointed; *tail* inflected.

This genus is exceedingly troublesome to horses, cattle, and sheep, in the skins of which they deposit their eggs; which soon change into larvæ, that feed under the skin of living animals; the larvæ are soft, smooth, annulate, without feet, and in most species furnished with hook-like appendages.

2. *Tipula*. CRANE-FLY. *Mouth* arched over, by the upper jaw extending from the head; *antennæ* filiform, short; *feelers* two, recurved, filiform, longer than the head; *mouth* furnished with a very short recurved *proboscis*.

Many species of this genus resemble Gnats, they feed on various substances; larvæ without feet, soft and cylindrical; pupa cylindrical, horned; some species reside amongst the roots of aquatic vegetables, others, among grass; but by far the greater number are aquatic. The perfect flies are found in abundance in the autumnal months.

3. *Diopsis*. *Antennæ* very small, setaceous; *eyes* placed on very long *foot-stalks*.
5. *Musca*. FLY. *Antennæ* very short; *palpi* wanting; *mouth* furnished with a soft fleshy *proboscis*, with two equal lateral *lips*.

5. *Tabanus*. *Mouth* with a fleshy strait *proboscis*, terminating in two equal *lips* : *antennæ* short, placed near together ; in some species furnished with a projecting *tooth* near their bases ; *rostrum* with two pointed *feelers*, situated on each side, and parallel to the *proboscis*.

Many of this tribe greatly resemble the last genus, they are exceedingly troublesome to various kinds of Quadrupeds, feeding on the blood which they suck out through their *proboscis* ; their larvæ are found in moist grass places.

6. *Culex*. GNAT. *Antennæ* filiform, in some species simple, in others, beautifully feathered ; either in whorls, as at fig. 38, or simply feathered, as fig. 39, plate 3 ; *mouth* consisting of setaceous *piercers* contained within a flexible *sheath*.

These well known insects derive their subsistence in the manner of the preceding genus, by sucking the blood of large animals ; in the larvæ state they are aquatic, and feed on the smaller kinds of water insects, which abound in stagnant waters ; they are of very singular forms, and are objects particularly suited for the Microscopic observer.

7. *Empis*. *Antennæ* setaceous, in others formed of three joints, the first of which is lanceolate, fig. 40, plate 3 ; *mouth* formed of a horny inflected bivalve *snout* longer than the thorax.

These insects live like the preceding genera, by sucking out the blood of other animals.

8. *Conops*. *Antennæ* varying in different species ; in some feathered, others, clavate, with a projecting bristle, fig. 41, plate 3 ; *mouth* with a projecting jointed *proboscis*.
9. *Asilus*. *Antennæ* filiform, of three articulations, figs. 42, 43, plate 3 ; *mouth* furnished with a strait, horny, two valved *snout*.

These insects feed principally on the smaller kinds of dipterous, and lepidopterous insects.

10. *Bombylius*. *Antennæ* of two joints, fig. 44, plate 3 ; *mouth* furnished with a very long strait, setaceous, bivalve *trunk*, with horizontal valves, including setaceous *piercers*.
11. *Hippobosca*. HORSE-FLY. *Antennæ* filiform ; *mouth* with a two valved cylindrical *snout* ; *body* depressed ; *feet* armed with several claws.

ORDER VII.

A P T E R A.

The various genera composing this order, are of such varied forms, that no general characters can be affixed, excepting that none of the order possess wings.

1. *Lepisma*. *Mouth* with two setaceous, and two capitated *feelers* ; *antennæ* setaceous ; *body* imbricated with minute scales ; *tail* terminated with diverging setaceous bristles ; *legs* six, formed for running.

In their various stages these insects are found on sweet substances, decaying fruit, and wood; the larva and pupa are six-footed, and very active.

2. *Podura*. *Antennæ* setaceous, elongated, in some three, and others four jointed; *palpi* sub-clavate; *body* scaly, *eyes* two, each composed of four *facets* or lenses; *tail* forked, bent under the body, by means of which the animals leap; *legs* six, formed for running.

This genera, consists of small insects, their haunts are usually in damp places, under stones, in the crevices of the bark of trees, and such like places; they are very active, and feed on the leaves of plants, the larvæ and pupa, are six-footed, active, and resemble the perfect insects.

3. *Pediculis*. LOUSE. *Antennæ* as long as the thorax; *mouth* furnished with a retractile recurved *piercer*; *abdomen* depressed; *legs* six, formed for walking.

This is a very extensive genus, of very remarkable forms, but having no claims to elegance or beauty; they live by extracting animal juices; the larvæ and pupa are six-footed, active, and nearly resemble the perfect insect.

4. *Pulex*. FLEA. *Antennæ* moniliform, declining; *mouth* with an inflected, cylindrical, setaceous *snout*, including a *piercer*; *eyes* two; *abdomen* compressed; *legs* six, formed for leaping.

The eggs of this genus are of a white colour, and are ge-

nerally deposited on the skins of some other animal, from these in a short time the larvæ are hatched, which are destitute of feet ; of a lengthened form, and thickly beset with hair ; their larvæ are often found in the nests of birds, attached to the young brood, on the juices of which they feed ; in a few days they arrive at full growth, and then change into the chrysalis state, the pupa is enveloped in a cotton like case, these remain a longer or shorter time in this state, according to the season of the year, in warm weather about twelve days is the usual time ; when the perfect insect is then developed.

5. *Acarus*. MITE. *Palpi* two jointed, shaped like the legs ; *eyes* two, situated on each side of the head ; *legs* eight.

The larger number of the Acari, are amongst the most minute of the insect tribes, they feed on various substances, but mostly on those in a state of decay ; some of the larger kinds, as that well known insect the Tick, live on the juices of other animals ; so numerous is this tribe, that perhaps it is not too much, to say, that, almost every animal has some one peculiar to the species..

6. *Hydrachna*. *Head*, *thorax*, and *abdomen* united ; *feelers* two, jointed ; *eyes* two, four, or six ; *legs* eight, ciliate, formed for swimming.

An aquatic genus, feeding on the larvæ of various other aquatic insects.

- This genus bear a considerable resemblance to the *Araneæ*, several of the species being commonly known by the name of long legged spiders, particularly the *P. Opilio*, or Harvest Spider; they prey on smaller insects.

- But few animals are beheld with greater disgust than Spiders: in every stage of their existence they prey with the most unrelenting ferocity, on every animal they can overcome, not sparing their own kinds.

- All the species of this genus are armed with a poisonous sting, but are not esteemed dangerous, except some of the

larger species, inhabiting warm climates : they are viviparous, and change their skins in the manner of Spiders.

10. *Cancer*. **CRAb.** *Legs* eight, sometimes six or ten ; besides two chelated *hands* ; *eyes* two, distant, generally pedunculated, elongated, and moveable ; *tail* jointed, unarmed.

This genus is divided into *Crabs*, having a roundish flattened body : *Lobsters*, with the body elongated ; tail moveable ; chelate claws, two, flattened, furnished with a moveable thumb : *Cray-Fish*, with an elongated spinous body, tail moveable, chelate claws four-sided. These animals feed on all kinds of animal substances either fresh or putrid ; they annually change their shells.

11. *Monoculus*. *Legs* four or eight, very long, formed for swimming ; *body* covered by a crustaceous tegument ; *eyes* in most species approximated, and imbedded in the shell.

Most of this genus are small aquatic insects, scarcely discoverable but with the microscope, some few are large, and the largest of the Insect tribe, is found in this genus, the *M. Polyphemus*, which has been known to measure two feet in length, exclusive of the tail ; in those species, said to possess only one eye, (from whence the generic name,) the two eyes are so approximated, as to appear single. Food as the last.

12. *Oniscus*. **WOOD-LOUSE.** *Jaws* truncate ; *antennæ* setaceous ; *body* oval ; *legs* fourteen.

Food, animal and vegetable substances; these cast their shells or skins like the preceding genera.

13. *Scolopendra*. CENTIPEDE. *Antennæ* setaceous; *body* depressed, elongated; *legs* numerous, equalling in number the segments of the body on each side; *feelers* two, setaceous.

These are a disgusting tribe, frequenting dark and noisome places, as under stones, or in decaying wood, some few are found in fresh, and fewer in salt water, they prey on other insects, and decaying animal substances.

14. *Julus*. *Antennæ* moniliform; *palpi* two, jointed; *body* nearly round; *legs* very numerous; *feet* twice as many as the segments of the body on each side.

This genus is found abundantly in the decaying mould within hollow trees, and particularly abound in putrid fungi; when disturbed, they roll themselves up in a spiral form. All the genera in this order, are instantly killed by emersion in spirits.

We shall now proceed to the methods of collecting Insects, which are of two kinds, by breeding them from the egg or Caterpillar, or by catching them in their perfect or fly state. Of these, the former is much to be preferred, as besides the pleasure arising from observing their gradual developement from the egg to the perfect Fly, we can destroy them previous to their having injured themselves by flight or otherwise; the difficulty of procuring the most beautiful and

valuable of the Lipedopterous class, in their fly state, makes this method the most eligible.

Insects of the *Coleoptera* class, are found in the grub or caterpillar state, (in which they are often extremely injurious to the Agriculturist,) at the roots of trees and plants, or in the decaying hollows of trees, and may be reared as directed for the Lipedoptera, paying attention to their peculiar kinds of food. This class of Insects are easily obtained in their perfect state; some crawl about and fly in the day time, while the sun shines warm, others, like the moths, only appear in the evening; they inhabit a great variety of places, some, the decaying hollows of trees, as the Stag Beetle, and many of the *Cerambyces*; others, the dung of various animals, some reside in putrid bodies, as the *Sylpha Vespillo*; numbers are found on the stems and leaves of plants, as the *Scarabeus Melolontha*, the COCK-CHAFER; *Coccinella*, LADY-BIRD; *Chrysomelæ*, *Curculiones*, &c.; others delight in the flowers of plants; some abide entirely in woods, as many of the *Cerambyces*; and they are often found in considerable numbers under the bark of decaying trees, some are found on the surface of stagnant waters, or on the stems of aquatic plants; others in pools, ditches, ponds, and the like; some are discoverable by the light they emit, as *Lampyris Noctiluca*, the GLOW-WORM, and a vast number are to be found on dry path-ways, sandy banks, and sand pits, particularly when the sun shines warm. As this class of Insects are not liable to injury by being carried a distance, the best mode is to have a number of common pill boxes, into which they may be put, and when the collector returns home, they may be instantly destroyed

without any external injury, by being immersed in boiling water. When dead, the Insect should be stuck through with a pin of the proper size, close to the suture that runs down the middle of the back, so as to make the pin pass a sufficient length through the body, and then secured on a piece of smooth cork, their legs and horns are to be placed in a natural position, by means of a pair of forceps, or fine tweezers, and should be kept so by the assistance of thin pieces of card-paper, as more fully directed for the class *Lipodoptera*; in which state when dry, they will ever afterwards remain; care should be taken not to place them in the store box, till thoroughly dry; indeed it would be well to place all insects in a gently heated oven, of such a temperature, that when a hair or feather is placed within, it will not curl up. Many of the Beetles are furnished with beautifully veined wings, which, when carefully distended, add much to the interest of a collection, these wings, which are curiously folded together, beneath the shells or horny covers, should be carefully drawn out with the forceps, and kept so with slips of card paper, as represented at A plate 3. It frequently happens, that Insects received from abroad, arrive in this country in a very bad state, with regard to setting, this may be rectified by placing them within the influence of steam for a short time, when their wings and legs will become flexible, and they may then be adjusted, as in recent specimens.

The Insects in the class *Hemiptera*, may be killed either by emersion in boiling water, or with a few drops of spirits of turpentine, and they should be set in the same manner as the preceding class. Many of the genera are found in fields, meadows, and on the leaves of trees, as the *Mantis*;

Gryllus, LOCUST or GRASS-HOPPER; *Fulgora*, or LANTERN-FLY: the *Gryllus domesticus*, or House-Cricket, is found in numbers, in bake-houses, and kitchens, particularly where there are ovens; the Cicadæ, are found on trees and plants, the Notonecta and Nepa, in stagnant waters; and the genus Aphis on trees and plants of various kinds.

Insects of the Lipedopterous class, from their elegance of form and beauty of colours, being most sought after by the young Entomologist, we shall enter more into detail with respect to the capture, rearing and preserving of them, and these instructions, with but few variations, will answer for the generality of Insects.

Most of the genus *Sphinx*, or Hawk Moths, are but seldom seen in the fly state, and when seen on wing, generally elude the swiftest pursuit; but in the Caterpillar state, are often found and easily taken. The Caterpillar of the Jessamine Hawk Moth, the largest and one of the most beautiful species of Moth this country produces, is frequently found feeding on the Jessamine and Potatoe; of the Elephant Hawk Moth, on the *Galium palustre*, or white Ladys Bedstraw, the Eyed Hawk Moth, on the Willow; the Lime Hawk Moth, on the Lime; Privet Hawk Moth, on the Privet; the Poplar Hawk Moth, on the Poplar; the Emperor Moth, on the Briar and Blackthorn, and in this manner, of numerous others. Besides the method of collecting Caterpillars, by attentively examining the leaves and other parts of trees at various periods of the year; many valuable ones may be obtained by beating the boughs of trees with long poles, and spreading a large sheet underneath for their reception, by this means

caterpillars may be caught, which would with great difficulty be obtained by any other method.

Caterpillars should be handled as little as possible, the more hairy ones are the least liable to injury from it. It will be necessary to carry a box for their reception, which should be partly filled with leaves, to prevent their being injured in carrying, this box should not be new, as the smell of new wood is frequently fatal to them, it will be well to have a part of the lid or sides cut out and covered with fine gauze, as it will then be less likely to injure them. The caterpillars once obtained, the next endeavour is to rear them; for which purpose they are to be supplied with some of the plant they are found feeding upon; although many, perhaps most, live on a variety of food, the larger part are attached to some particular kind, deprived of which, they frequently pine and perish.

To save the trouble of supplying them with fresh food daily, some sprigs of the tree or plant may be put into a wide mouthed bottle, filled with water, and the caterpillars placed on them. Most plants will remain in the vials fresh, for three or four days; the glass with the Caterpillars and their food, is to be placed in the Breeding Box, represented on the plate 6, fig. 1. and a supply of fresh food is to be given them as soon as the former appears in the least withering.

After they are arrived at their full growth, they decline eating, and either immediately or very soon change into the Chrysalis state; previous to which Butterflies spin a small

web, just sufficient to suspend themselves by ; many Moths, like the Silk-Worm, spin a large web, in which they enwrap themselves ; and a great number burrow into the earth, where they either spin a case, or change without any spinning ; as do most of the Hawk Moths : it will therefore be necessary to cover the bottom of the box with fine mould, to the depth of several inches, and to keep it constantly moist. Previous to going into the chrysalis, Caterpillars generally lose their brilliancy of colour, and some rove about for a considerable time. After remaining in the Chrysalis state till near the time of their coming forth, such as are inclosed in a hard case or shell, as the Puss, and Oak Moths, &c., are to be carefully freed from it, as the aperture which the Insect naturally makes, is often so small as not to permit it to pass out without injury to its plumage.

Butterflies and Moths may be found in the Chrysalis state, under projections of Garden walls, pales, in Summer and Out houses, and frequently attached to their food. A great variety of Moths in this state, may be found by digging in the Autumnal and Winter months, under the trees they feed on, particularly under the oak, willow, lime, elm, and poplar trees ; as also at the bottom of posts and garden pales ; when they are dug up from these situations, they should be placed as soon as possible in a box, and kept covered with moist earth till the ensuing spring, when they are to be taken up and placed just beneath the surface of the mould, and in that manner left to come forth themselves.

In digging for Chrysalises, it often happens that the collector finds numerous species of Beetles, who retire to such dormitories during the winter.

Most of the Lipedopterous Insects, unless caught the first day of their coming out of the Chrysalis, are worth little ; from which circumstance arises the necessity of carefully watching those particular times, and of making frequent excursions to have them in perfection. Butterflies are only caught on wing when the sun shines warm ; the greatest number of them are found in the vicinity of woods ; some delight in meadows, others in gardens, orchards, clover fields, commons, and shady lanes, most of those that frequent woods, may be taken with greater facility early in the morning, a few hours after sun-rise ; at which time they may be found feeding on flowers that grow by the sides of woods : but when the sun acquires more strength, they fly high, and so swift, as to be taken with the greatest difficulty.

Moths are mostly quiescent during the day, and come forth from their retreats at the approach of evening, soon after sun-set ; like Butterflies, they inhabit a variety of places, and are to be met with in the greatest numbers near woods : they may also be found during the day time, by beating the hedges, particularly towards evening, as at that time the least motion will put them on wing. Numbers may be found during day-time, adhering to the bark of trees, on the shady sides of walls and pales surrounding gardens, and under projecting pales in field fences, and may then be caught in the greatest perfection ; but few fly during the day time, and those that do, generally so high as not to be taken. It has been suggested that they may be taken in the dusk of evening with a net carried before a light, in the neighbourhood of woods, but those that are thus captured are of little worth, and are very liable to injury, owing to the

darkness. Expertness in using the nets, is only to be acquired by practice ; so soon as an Insect is captured, considerable caution must be used, as on killing it properly, its beauty in a great measure depends : it must not be taken hold of in any part, but by means of the net the wings must be, if possible, brought into an erect position, which done, the under side of the thorax or breast, should be taken between the thumb and fore-finger, and pressed sufficiently hard to destroy it : which may be done without injury to the wings, either by distortion or hurting the plumage.

The Spingees or Hawk Moths, as well as all Moths that possess large fleshy bodies, as the Puss and Goat, are very tenacious of life, we have found the most speedy method, as well as the one least injurious to the markings of the Insects, is as soon as the Moth is taken, to squeeze the breast, and then pass a pin through the thorax, but as this will not destroy the Insect, we recommend it to be placed either under a glass, or in a box, within the influence of a fire, for a few seconds, which quickly deprives it of life ; and though this mode may appear cruel, yet it is certainly merciful compared to the practice of suffering Insects to linger out their existence for days ; we have known the Goat Moth survive ten days, with a pin through its thorax, and at the expiration of that time, have sufficient strength to loosen the pin from the cork, and even to fly : if the heat they are exposed to exceeds 110 degrees of Farenhiet's Thermometer, and they are covered with a glass, so as to exclude atmospheric air, a few seconds will destroy them without external injury.

The wings of Butterflies and Moths are of so delicate a

texture, as not to permit their being caught without injury, except in nets of the finest materials ; the collector should in the first place furnish himself with one adapted to this purpose, that represented on the plate has been found to answer after repeated trials, better than any other. The net should be made of fine gauze, having its stiffness taken off by soaking it for some time in warm water, or if dyed green, which is the common practice, the soaking will be unnecessary.

He is next to provide himself with two or three oval boxes for the pockets, lined at the top and bottom with thin cork ; and a cushion well stored with pins of various sizes ; besides which, he should possess a pair of forceps, with flat sides, to take hold of such insects as are armed with stings ; the forceps known at the Surgeons Instrument-makers, by the name of Crane-necked, are peculiarly adapted for this purpose.

The Boxes most convenient for the pocket, may be purchased at most Toy Warehouses, and are generally sold in nests, these should be lined with thin pieces of cork, and neatly covered with paper. The cork is to be obtained at the Cork-Cutters, it must be close grained, and the surface as smooth as can be procured ; it should then be heated either before the fire, or in an oven, and whilst quite hot, should be placed between two pieces of smooth board, and either put into a strong press, or under a heavy weight, where it should remain for a day or two, till perfectly

flat; it should then be cut into thin slips, which is easiest done with a fine saw, screwing the cork in a vice, this done, the surfaces should be smoothed either with a fine rasp or file, and finally with pumice stone.

The cork is to be glued to the top and bottom of the boxes, and should not be less than one sixth of an inch in thickness; and the boxes so deep as to leave a space of half an inch between the heads of the pins, when stuck in the top and bottom, if they are of less depth than this, they can only be used for small Insects, or else may have the cork only at the bottom, all the pocket boxes should have some camphor enclosed in a piece of thin cloth fastened within, as the effluvia exhaled therefrom tends to stupify the Insects, and renders them less liable to injury from fluttering.

When any Insect is caught the Net should be carefully opened, and the Insect laid hold of gently by one of its Antennæ or horns, and again placed between the thumb and finger, in which position it should be held, while a pin (proportioned to the size of the Insect,) is passed through the upper part of the thorax or back, the insect is then to be placed in the pocket box, and the pin thrust sufficiently far into the cork, to prevent its being shaken out in walking. The next operation is to place it in a natural position; as though the Insects may by the foregoing methods, be caught in an uninjured state, something further is necessary to make them appear to advantage; this is called setting, and is done in the following manner: the Insect being stuck through with a pin of a suitable size, is to

be placed before its wings are become stiff and dry, on a piece of cork that has a smooth surface, covered with white paper, the body of the fly should not be permitted to touch the paper, when stuck upon it, but to stand up some little distance from it, so that it may appear as if resting on its legs; it being only the edges of the wings, and the point of the tail, that should come in contact with the paper, the wings are to be expanded as at C, plate 3, this is best done with a fine needle, or sharp-pointed instrument, which may be fixed in a handle.

The upper edges of the superior wings should be placed in a line with the head of the Insect, in which situation they are to be retained by means of small braces made of card-paper, cut into the shape as represented at fig. C, plate 3, these must be proportioned to the size of the wings, and fitted to their shape, by being more or less curved: by this plan, the spots and markings on the wings are rendered conspicuous, and the Insect appears to much greater advantage: however to succeed well in this operation, requires a considerable degree of practice and ingenuity: after remaining a few days, or till the Insect has become quite stiff, the braces may be removed, and the Insect placed in the store box, which should be so constructed, as to effectually exclude those little insects which are apt to infest and destroy collections of this kind; the shape of the store-box is immaterial, it should be lined with thin cork, covered with paper, and the edges or cover made to shut quite close, if covered with glass, some strips of paper must be pasted over the edges.

Most of the Insects contained in the order Neuroptera, are aquatic in their immature state, and when arrived at the

perfect or Fly state, are generally found about waters, as *Libellula*, DRAGON-FLY; *Ephemera*, DAY-FLY; *Phryganea*; *Hemerobius*.

The genus *Myrmelion* or ANT-LION, is found in the fly state, in the vicinity of sand banks. Most of these Insects may be caught with little injury, in the gauze nets, used for Lipedopterous Insects. They should as soon as caught, be gently squeezed beneath the thorax, either with the thumb and finger, or with the forceps described when speaking of Butterflies and Moths; or they are speedily killed with spirits of turpentine. The same plan is to be pursued in setting them, as in the preceding class.

As the major part of the genera comprising the class Hymenoptera, are furnished with stings, care will be necessary to avoid being injured thereby, they may for the most part be best captured in the forcep nets, see plate 6, fig. 4. The best mode of killing these Insects is by placing them in a box, or under a glass, and exposing them to the action of heat, either by holding the box close to the fire, or placing it in an oven for a few seconds, which immediately kills them, without injury to their colours. Boiling water hurts their wings, and also the fine hairs with which the bodies of some kinds are covered, spirits of wine or turpentine quickly proves fatal to some, whilst others do not appear at all affected by them; the turpentine also frequently injures the colours. When dead their wings should be expanded, the pin that is passed through the thorax, must be sufficiently long to permit the legs of the insects to be placed in a natural posture.

The *Cynips* or GALL-FLY, is best taken by collecting the protuberances formed by the parent fly, on different kinds of trees, and watching the developement of the perfect Insect. The *Ichneumones*, may be reared by obtaining for the Insects in which their eggs are deposited, as Caterpillars, Spiders, &c. The *Sphex* resides principally in flowers, and about sand banks, in which it buries such insects as it catches, and in them it deposits its eggs. The *Chrysis*, some of which vie in beauty with the Diamond Beetle, is found flying in sunny weather, about old walls, pales, posts, and sand banks, in which it forms its nest. Wasps, Bees, and Ants, are found on most kinds of flowers, fruits, and on almost every thing that is sweet.

There are but few places that do not produce abundance of the Insects belonging to the class *Diptera*, as the various kinds of flies and gnats; they are more particularly found about all kinds of plants and flowers, especially umbelliferous ones, some of them are constantly flying about cattle of different kinds, on the skins of which they deposit their eggs, as the *Oestrus*, GAD-FLY; *Tabanus*, &c.

These insects may be readily killed by spirits of wine, or turpentine, their wings should be so expanded, that their bodies become apparent and a small brace should be placed under the body to prevent its becoming incurvated in drying.

The Insects in the class *Aptera*, are so variously dispersed, that no general instructions are necessary for their capture; the Scorpion, Centipedes, *Julus*, &c., are found in noisome places, as under decaying wood, stones, in damp

cellars, in decaying animal substances, as also in various kinds of putrid fungi, the greater part of this class are most conveniently preserved in spirits, from which, at any subsequent period, they can be removed to the cabinet.

CLASS IV.

VERMES.—*WORMS*.

This is the last class of Zoological subjects, and contains an incongruous assemblage of Animals, possessing no one character in common : they are generally of slow motions, their substance soft ; many of them are without any distinct head, and most kinds are destitute of feet.

Worms are supposed to be destitute of Brain, Ears, Nostrils, and frequently of Eyes, Feet, and external covering ; the generality are very tenacious of life, and possess the power of restoring lost or injured parts ; and likewise of being renewed or perpetuated from parts of the original animal ; the orders are principally distinguished by their tentacula or feelers.

Of this class of Animals, though the whole are highly curious, but few are likely to fall under the notice of the collector, of such kinds we shall merely enumerate their generic character, but of those of more general interest, we shall, as in the preceding classes, annex a brief outline of their habits and œconomy. But few contribute directly to the support or conveniences of human

life; though they all have a share in supporting the numerous other tribes of Animals; likewise, by their various perforations in the earth, they add to its fertility, by giving free access to the air and water.

Linnaes divided them into five orders.

ORDER I.

INTESTINA.—INTESTINE WORMS.

The Animals of this Order, are of the most simple construction; they are destitute of limbs, and are divisible into intestinal, or such as inhabit the bodies of other Animals; and Earth-Worms, or such as are usually met with on the ground, this latter tribe are further separated into those with and without lateral pores.

* *Intestinal; eyes wanting.*

1. *Ascaris.* Body round, tapering at both extremities; head with three vesicles.
2. *Trichocephalus.* Body round, tapering towards the tail; head furnished with a proboscis.
3. *Uncinaria.* Body filiform, elastic; head with membranous angular lips; tail of the female, needle shaped; of the male, armed with two hooks encased in a pelucid vesicle.

4. *Filaria*. *Body* entirely filiform.
5. *Scolex*. *Body* minute, gelatinous, opaque ; *head* exertile and retractile ; with four pellucid *auricles*.
6. *Ligula*. *Body* linear, equal, long, with an impressed dorsal suture.
7. *Linguatula*. *Body* depressed, oblong ; *mouth* situated forwards, and surrounded by four *passages*.
8. *Strongylus*. *Body* round, long, the fore-part globular and truncate, with a circular *aperture* fringed at the margin ; *hind-part* of the male *hooded*, of the female *pointed*.
9. *Echinorhynchus*. *Body* round ; *proboscis* cylindrical, retractile, crowned with *hooked prickles*.
10. *Hæruca*. *Body* round ; *proboscis* wanting ; *head* crowned with *prickles*.
11. *Cuculanus*. *Body* pointed behind ; the fore part obtuse, with an orbicular *mouth*.
12. *Caryophyllæus*. *Body* round, smooth, with a large dilated *mouth*.
13. *Fasciola*. FLUKE. *Body* depressed, ovate ; with a terminal and lateral *pore*.
14. *Tenæa*. TAPE-WORM. *Body* flat, jointed ; *head* with four *orifices* for suction, below the *mouth* ; *mouth* ter-

minal, mostly crowned with a double series of retractile *hooks*.

An extremely troublesome and injurious tribe, inhabiting the intestines of Mankind, as also several species of Quadrupeds and Birds ; they are very tenacious of life, and are reproduced from parts or joints that accidentally become detached.

15. *Furia*. *Body* linear, ciliated on each side with reflected appressed *prickles*.

****** *Not inhabiting other Animals.*

16. *Gordius*. HAIR-WORM. *Body* equal, filiform, round and smooth.

17. *Hirudo*. LEECH. *Body* truncate at each extremity ; *head* and *tail* dilated when in motion.

******* *Not inhabiting other Animals, but furnished with a lateral pore.*

18. *Lumbricus*. DEW, or EARTH-WORM. *Body* round, annulated, furnished with minute concealed *prickles*.

19. *Siphunculus*. TUBE-WORM. *Body* round ; *mouth* cylindrical, and narrower than the head, *aperture* on the side.

20. *Planaria*. *Body* gelatinous, depressed, with a double ventral *pore*.

ORDER II.

MOLLUSCA.

The bodies of all this order are simple, and furnished with limbs; many of them are destitute of any coat or covering, some are quite gelatinous, and others furnished with a crust or shell, which differs in substance from the shells of Testaceous Animals, the latter being principally composed of carbonate of lime, and those of Crustaceous Animals, of phosphate of lime. But few of them are applicable to the uses of Mankind. There are thirty-two genera in the order.

* *Mouth placed above.*

1. *Actinia.* Body fixed, with a single terminal dilatable aperture, surrounded with *tentacula* or *cirri*.
2. *Clava.* Body fixed, with a single vertical dilatable aperture, surrounded with clavate *tentacula*.
3. *Pedicellaria.* Body fixed, and furnished with a rigid peduncle.
3. *Mammaria.* Body not affixed, smooth, with a single aperture, without *cirri*.
5. *Ascidia.* Body fixed, with two apertures, one of which is terminal, the other situated a little beneath.

6. *Salpa*. Body not affixed, with two apertures, one at each extremity.

7. *Dagysia*. Body tubular, not affixed, angular, open at each end.

** Mouth situated before.

8. *Pterotrachea*. Body pervious, gelatinous, with a moveable fin at the head or tail.

9. *Derris*. Body round, tapering, jointed ; feelers two.

*** Mouth situated before ; body with a lateral perforation.

10. *Limax*. SLUG. Feelers four ; vent common with the lateral pore.

11. *Laplaysia*. Feelers four ; vent placed above the lower extremity.

12. *Doris*. Feelers two ; vent as the last genus.

13. *Tethys*. Body with two small pores on the left side.

**** Mouth before ; body surrounded with feelers on the fore part.

14. *Holothuria*. Feelers or tentacula fleshy, numerous, at one extremity surrounding the mouth.

15. *Terebella*. Feelers or tentacula capillary, ciliated, sur-

rounding the *mouth*, which is at the end, and furnished with a *club-shaped proboscis*.

***** *Mouth before ; body furnished with arms.*

16. *Triton*. *Arms* twelve, divided, some of them *clawed*.

17. *Sepia*. CUTTLE. *Arms* six or eight, furnished with concave *disks* or suckers on the inner sides ; *tentacula* two, long, expansile ; *mouth* formed like a beak ; *eyes* situated beneath the *tentacula* ; *body* fleshy.

This genus is found in the shallows of most seas, some of the kinds grow to a vast size, particularly those that are natives of high latitudes, they are said to acquire such a magnitude, as to become dangerous to the natives who navigate the Indian seas, in canoes, and that they always provide themselves with an axe, that should the Cuttle throw its arms over their boats, they may cut them off, to prevent their boat from sinking ; and we are informed, specimens have been seen measuring two fathoms across the centre part, and each of the arms nine fathoms long.

18. *Clio*. *Arms* two, membranaceous, extended.

19. *Onchidium*. *Arms* two, dilated, situated at the sides of the head.

20. *Lobaria*. *Body* convex above ; beneath flat, and lobate.

21. *Lernæa*. Arms two or three on each side, round, slender ; caudal ovaries two.

22. *Scyllæa*. Arms six, in pairs, distant.

***** Mouth before ; body provided with peduncles or feet.

23. *Aphrodita*. Body oval, furnished with eyes ; feelers two, setaceous, annulate.

24. *Amphitrite*. Body annulate, issuing from a tube ; tentacula feathered ; eyes wanting.

25. *Spio*. Body articulated, proceeding from a tube ; feelers two, long, simple ; eyes two.

26. *Nereis*. Body long, creeping, with lateral pencilled peduncles or feet ; feelers simple.

27. *Nais*. Body long, creeping ; peduncles or feet furnished with simple bristles ; feelers wanting ; eyes two, or wanting.

***** Mouth situated beneath, generally central.

28. *Physosopora*. Body gelatinous, supported by an Air-bubble.

29. *Medusa*. SEA-NETTLE. Body gelatinous, smooth ; mouth beneath in the middle ; tentacula placed below.

30. *Lucernaria*. *BODY* gelatinous, wrinkled, and provided with *arms*.
31. *Asterias*. SEA-STAR. *BODY* contained in a flat, and mostly radiated coriaceous case or *shell*; which is covered with numerous retractile *tentacula* or *papilleæ*.
32. *Echinus*. SEA-EGG. *BODY* covered with a crustaceous shell; mostly beset with numerous moveable *spines*.

ORDER III.

TESTACEA.—MOLLUSCA,

COVERED WITH A CALCAREOUS SHELL OR SHELLS.

This Order, to which the attention of Naturalists is now generally directed, forms a distinct branch of Natural History, under the name of Conchology, it is composed of Animals, for the most part belonging to some of the genera in the preceeding order, but provided with hard external coats or shells; from the great difficulty experienced in procuring the inhabitants of the shells, they have by general consent been classed from the various forms of their tenements.

Many kinds are applied by Mankind to the purpose of food, the shells of others are manufactured into various useful or ornamental articles; they feed principally on molluscous animals, and small insects; some on vegetable substances, and others on putrid animal matter; and they are devoured by various kinds of fish, and the larger mollusca. The order is subdivided into three distinct families; comprising in the whole, thirty-six genera.

* *Multivalves : shells in several parts.*

1. *Chiton*. COAT OF MAIL-SHELL. Inhabitant of the shell, a *Doris*.

Valves many, disposed in an imbricated manner, or with the edges lying one over another. Plate 4, fig. 1.

All the *Chitons* are natives of the Ocean, and are generally found adhering to rocks or stones, that are overflowed by the tide.

1. *Lepas*. ACORN-SHELL. Inhabitant a *Triton*.

Shell of several upright unequal *valves*, adhering to various extraneous substances, either by their bases, or by flexible *peduncles*.

This genus has been separated into two families ; the first containing the *Balani* or BARNACLE SHELLS, having flat bases, plate 4, fig. 2, the second the *Lepas*, or ACORN-SHELLS affixed on flexible *peduncles*. Plate 4, fig. 3.

The whole of this family are found adhering to various substances within the influx of the sea, as the bottoms of vessels, pieces of wood, or affixed to other shells.

3. *Pholas*. PIERCE-STONE. Inhabitant an *Ascidea*.

Shell composed of two large *valves* and several lesser ones at the *hinge* ; which is recurved and toothed. Plate 4, fig. 4.

The *Pholades* inhabit clay, soft spongy stones, and wood, situated beneath the surface of the water, which they per-

forate whilst in their young state, and continue to enlarge their habitation or prison, as they encrease in bulk ; they all emit a phosphoric light, most evident, whilst the animal is in a living state.

**** Bivalves.** *Shells in two parts united by a cartilaginous hinge.*

4. Mya. GAPER. Inhabitant an *Ascidea*.

Shells gaping at one or both ends ; *hinge* with generally one thick, strong, broad *tooth*, which is not inserted into the opposite valve. Plate 4, fig. 5.

These are found on the margins of the sea and rivers, and are discoverable by a small hole or aperture in the mud or sand ; some of the kinds are used as food, and others produce pearls in considerable abundance.

5. Solen. RAZOR-SHELL. Inhabitant an *Ascidea*.

Shells oblong, gaping at both ends ; *hinge* with one or two subulate *teeth*, which are not inserted into the opposite shell. Plate 4, fig. 6.

The Solens penetrate the sands of the sea shore, in a perpendicular direction, to the depth of six to twelve inches, and are easily discovered by an indentation in the sand ; some of the kinds are edible.

6. Tellina. BENT-WEDGE. Inhabitant a *Tethys*.

Shells generally sloping to one side; *hinge* with three teeth, the side ones either plain or wanting, in one valve. Plate 4, fig. 7.

They are divided into three families, * OVATE and thickish, ** OVATE, compressed, *** SUBORBICULAR. Their shells are usually found buried in the sand or gravel on the sea shores, and some kinds in rivers or ditches.

7. *Cardium*. COCKLE. Inhabitant a *Tethys*.

Shells mostly equilateral, equi-valve, usually convex, longitudinally ribbed; *margin* toothed; *teeth* two near the beak, with larger side ones, each locking into the opposite valve. Plate 4, fig. 8.

The Cockles are generally natives of the ocean, residing immediately beneath the sand on the sea shore; most of them are applicable to the purposes of food.

8. *Macra*. FLAT-SIDED COCKLE. Inhabitant a *Tethys*.

Sides of the shell unequal; *valves* equal, the middle *tooth* complicated with a small concavity on each side; *lateral teeth* remote, and mutually inserted. Plate 4, fig. 9.

These are generally found at the mouths of rivers, immediately beneath the surface of the sand, or among rejectamenta of the sea.

9. *Donax*. WEDGE-SHELL. Animal a *Tethys*.

Anterior of the shell obtuse; *margin* crenulated; *hinge* with two *teeth* on the centre, and sometimes one or more marginal remote ones. Plate 4, fig. 10.

Generally found in the sand on the sea shores; when left dry by the reflux of the tide.

10. *Venus*. VENUS-SHELL. Inhabitant a *Tethys*.

Lips of the shells incumbent at the front margin; *hinge* of three approximated teeth, the lateral ones diverging. Plate 4, fig. 11.

This genus is separated into three sections, * SUBCORDATE, ** ORBICULAR, *** OVAL, a little angular on the front margin.

The whole of this elegant genus are oceanic, being either found in the mud or sand, when the tide has receded, or fished up from very deep water.

11. *Spondylus*. Inhabitant a *Tethys*.

Shell with unequal *valves*, one flat, the other convex, of a rough, hard, and frequently spinous surface, often eared; *hinge* with two recurved *teeth*, having an intermediate hollow. Plate 4, fig. 12.

All this genus are found adhering to rocks at considerable depths in the ocean, from which they are with difficulty detached.

12. *Chama*. CLAMP-SHELL. Inhabitant a *Tethys*.

Shells strong, rugged; *hinge* with a gibbous callous, or *tooth*, which is obliquely inserted into the opposite valve.
Plate 4, fig. 13.

These, like the last genus, are found in very deep water, they all inhabit the sea, some of the kinds grow to a great size, and all are edible.

13. *Arca*. ARK-SHELL. Inhabitant a *Tethys*.

Shell equivalve; *hinge* with numerous *teeth*, alternately inserted between each other. Plate 4, fig. 14.

This genus is divided into four sections, * EDGE entire, BEAK inflected: ** EDGE entire, BEAK reflected: *** EDGE notched, BEAK recurved: **** EDGE notched, BEAK inflected.

The Ark-Shells are found in the sea, and on the sands and mud on the shores of the ocean, generally between low and high-water marks; some of them are occasionally used as food.

14. *Ostrea*. OYSTER. Inhabitant a *Tethys*.

Valves in some unequal; or one flat, and the other concave, sometimes *eared*; *hinge* without *teeth*, with a hollow cavity. Plate 4, fig. 15.

This is divided into three families, * having **RADIATED** equal or unequal **EARS**; ** **SURFACE** of the shells rough and **PLATED** on the outside; *** **HINGE** with a perpendicular **GROOVED LINE**.

Oysters are esteemed as a delicate and nutritious food; and the shells of some of the kinds are converted to many useful purposes; they all inhabit the ocean, and are generally found in great numbers, either among sand, or adhering to rocks and stones. They are familiarly divided into Oysters and Scallops, our figure represents one of the latter kinds.

15. *Anomia*. *Shell* inequivalve; one of the *valves* flattish, the other gibbous, one or both valves are often *perforated* near the hinge. Plate 4, fig. 16.

This genus is confined to the ocean, the species being often found affixed by a ligament that passes through the perforation, to various kinds of fuci, and other substances.

16. *Mytilus*. **MUSCLE**. Inhabitant allied to an *Ascidea*.

Shell mostly adhering to some extraneous substance, by its silky *beard*; *hinge* without teeth, having in most kinds a *longitudinal hollow line*, often crenulate. Plate 4, fig. 17.

Muscles are found in the sea, rivers, lakes, and ponds, generally affixed to other substances; some kinds perforate rocks, where they ever after reside; such as frequent fresh

waters, are found on the surface, or immediately under the mud, some are used as food, and often produce small pearls.

17. *Pinna*. NACRE. Inhabitant a *Limax*.

Shell of two parts, connected by a *toothless hinge*, by which the *valves* are inseparably united ; the substance of the shell fragile, provided with a *bysus* or *beard* ; gaping at the larger end. Plate 5, fig. 1.

This which forms the connecting link between the Bivalve and Univalve shells, is so formed as to possess equal claims to either division ; the suture or hinge by which the two parts are united, is of a different substance to the shells, but is hard and not flexible ; of the byssus (a sort of silk) is manufactured various articles of apparel, and Manufactories are established for this purpose at Naples and Palermo.

The *Pinnæ* are all inhabitants of the ocean ; in the sand and mud on the shore of sheltered bays, they may be often obtained standing erect, or affixed by their beards to rocks and stones.

*** *Univalves ; Shell of one entire piece.*

DIVISION I.

WITH A REGULAR SPIRE.

The almost imperceptible gradation, in this beautiful Class of Animals, renders the present mode of classification peculiarly interesting ; as we are not under the necessity of

separating nearly allied families ; a circumstance too often observable in the classing of most other natural productions. Our remarks on the last genus (*Pinna*) will with almost equal propriety apply to the first genus in the present order, which has the appearance of being composed of two separate sides, but united by a narrow strip or keel of the same texture, which forms a near alliance to the Bivalve shells.

Most of the shells of this division possess a regular spiral curve, very conspicuous in many of the genera, but gradually becoming obsolete.

18. *Argonauta*. PAPER NAUTILIS. Inhabitant a *Sepia* or *Clio*.

Shell entire, spiral, involute, membranaceous ; *aperture* consisting of one *chamber*. Plate 5, fig. 18.

All the *Argonautæ* are marine shells, of exceedingly brittle texture, and possess a great degree of elegance of form. The ancients are said to have derived the art of navigation from the animals inhabiting these shells ; which in calm weather, are seen floating on the surface of the water, with some of their tentacula extended at the sides, whilst two arms that are furnished with membranaceous appendages, serve the office of sails, from whence those beautiful lines ;

“ Learn of the little Nautilus to sail
Spread the light oar and catch the passing gale.”

These animals raise themselves to the surface of the sea, by ejecting the sea-water from their shells ; and on the approach of danger, they draw in their arms, and with them a quantity of water, which occasions them to sink immediately ; by possessing this power they are but rarely taken

perfect, as the instant they are disturbed, they disappear, and are only accidentally brought up in the nets of fishermen, or found left dry on rocks.

19. *Nautilus*. SAIL-SHELL. Inhabitant a *Sepia*.

Shell univalve, convolute, smooth, composed of many *chambers* or compartments, which are perforated and connected by a *thin testaceous pipe*. Plate 5, fig. 19.

These shells are separated into three families, * *Spiral*, with the spines connected; ** *Spiral*, with the *Whorls* distinct; *** *Longish*, and somewhat strait.

The Nautili have a considerable resemblance to the last genus, like which, they are often seen floating on the surface of the ocean; but are readily distinguished by their shells having many, and the former genus only one chamber. The larger kinds are entirely marine, some of the smaller species are found in rivers, brooks, and ponds, frequently adhering to the leaves and stems of aquatic plants, and to pieces of wood; others are found only in a fossil state.

20. *Conus*. CONE-SHELL. Inhabitant a *Slug*.

Shell univalve, convolute, turbinate; the *aperture* effuse, longitudinal, linear, without teeth, entire at the base; *columella* smooth. Plate 5, fig. 20. This genus is divided into five families; * *Spire* truncate, or flat; ** *Pyriform*; *** *Elongated*; **** *Ventricose*, contracted at both ends; ***** thin; *Ventricose*.

Most of the Cone-Shells are covered with an epidermis, under which, the surface bears a most beautiful polish; all the species are marine, and are generally found on rocky coasts.

21. *Cypræa*. COWRY, or GOWRY. Inhabitant a *Limax*.

Shell involute, nearly oval, smooth, obtuse; *aperture* effuse at both ends, and longitudinally toothed on both sides. Plate 5, fig. 21. This family is separated into four divisions, * *mucronate* or pointed; ** *obtuse*, and without any perceptible spire; *** *umbilicate*, or with a small perforation; **** *margined*.

A most beautiful family, mostly marine, inhabiting the sand at the bottom of the sea, from whence they are often thrown after violent storms; most of the kinds possess an exquisitely fine natural polish.

22. *Bulla*. DIPPER. Inhabitant a *Slug*.

Shell convolute, sub-oval, unarmed; *aperture* oblong, smooth, longitudinal, entire at the base; *columella* smooth, oblique. Plate 5, fig. 22.

The Dippers are found inhabiting the sea, rivers, lakes, and ditches; the texture of most of the sorts is exceedingly thin; the marine kinds are sometimes found in shallows, during the recess of the tide.

23. *Voluta*. VOLUTE. Inhabitant a *Slug*.

Shell convolute ; *aperture* narrow, without a beak ; *columnella* plaited. Plate 5, fig. 23. This genus is composed of five families ; * *aperture* entire ; ** *subcylindrical*, emarginate ; *** *oval*, effuse, emarginate ; **** *fusiform*, or spindle shaped ; ***** *ventricose*, spire papillary at the top.

This is a very extensive genus, the greater part of which are natives of the tropical seas, and are only found on the shores after storms ; but few kinds are European, and these do not possess any great degree of beauty, whilst the tropical kinds are amongst the most beautiful of the whole tribe.

24. *Buccinum*. WHELK. Inhabitant a *Limax*.

Shell spiral, gibbous ; *aperture* oval, terminating in a *short canal* inclining to the *right*, with a *short beak* ; *interior lip* flattened. Plate 5, fig. 24. This genus is divided into eight families ; * *inflated*, rounded, thin, nearly transparent, brittle ; ** with a *short exerted reflected beak*, lip unarmed outwardly ; *** *outer lip* prickly on the hinder margin, in other respects corresponding with the preceding ; **** *Columella lip* dilated and thickened ; ***** *Columella lip*, as if worn flat ; ***** *smooth*, not included in the preceding division ; ***** *angular*, not previously included ; ***** *tapering*, awl shaped and smooth.

Most of this genus are found adhering to rocks or stones, beneath the surface of the ocean, but some few are terrene

their shells are generally strong, rough, and hollow ; and their flesh may with safety be used for food.

25. *Strombus*. SCREW-SHELL. Inhabitant a *Limax*.

Shell spiral, expanded ; *aperture* much dilated, and the *lip* expanding, produced in a groove, inclining to the *left*. Plate 5, fig. 25. There are four families in this genus, * *Outer Lip* digitated, projecting in linear divisions or claws ; ** *Lobed* ; *** *Dilated* ; **** *Tapering* with a long spire.

All the *Strombi* are inhabitants of the ocean, and are usually found upon rocky shores.

26. *Murex*. ROCK-SHELL. Inhabitant a *Limax*.

Shell spiral, roughened with protuberances ; *aperture* oval, terminating in a narrow strait canal, inclining backwards. Plate 5, fig. 26. There are seven divisions in this genus ; * *Spinous*, with a produced beak : ** having *Longitudinal sutures* expanded into crisped or curled *Foliations*, *Beak* short : *** with thick rounded, protuberant *Sutures* : **** more or less *spinous*, *Beak* wanting : ***** without *spines*, having a long, strait, pointed *Beak* : ***** *Tapering*, with a long *spire*, and short *beak* : ***** with a *toothed columella*.

Most of this genus are found on rocky shores, within the influx of the tide, some few burrow in the sand, and the whole are entirely marine. Their shells are mostly rugged,

strong, and heavy, from which circumstance they have obtained the name of Rock-Shells.

27. *Trochus*. TOP-SHELL. Inhabitant a *Slug*.

Shell spiral, conical ; *aperture* angular, sometimes three or four sided, or with the angles rounded ; *columella* oblique. Plate 5, fig. 27. There are three families in this genus : * erect, *Columella* perforated : ** *Imperforate*, erect, with the *umbilicus* closed : *** *Tapering*, with an exerted *Columella*, and falling on the side when placed upon the base.

Most kinds are marine, and some few are found on land in moist places ; the generality of them reside in deep water, others in shallows, that are left nearly dry at the reflux of the tide ; the species are very numerous, and several kinds are common to the British shores.

28. *Turbo*. WREATH-SHELL. Inhabitant a *Slug*.

Shell spiral : *aperture* round, entire, contracted. Plate 5, fig. 28. The genus is composed of five families : * *Pillar Margin* of the aperture dilated, *imperforate* : ** solid, *imperforate* : *** solid, *perforate* : **** *cancellate* : ***** *tapering*.

Some of the species in this and the preceding genera, are very likely to be confounded, but by attentively observing the round or angular form of their apertures, their proper family may readily be determined. Most of the kinds

inhabit the sea, some fresh waters, and others are met with on land, the most valuable marine species are fished up from deep waters, or found adhering to rocks and stones below high-water mark. This is a very extensive genus, and a very considerable number are found on the British shores.

29. *Helix*. SNAIL. Inhabitant a *Slug*.

Shell spiral, thin, brittle, almost transparent; *aperture* semi-lunar or circular. Plate 5, fig. 29. There are five families of this genus: * *Whorls*, compressed, or acutely carinate: ** *Umbilicate*, whorls rounded: *** *Imperforate*, whorls rounded: **** *Tapering*: ***** *Ovate*, imperforate.

Of the land species, almost every place produces some one or other of the kinds, they are found on trees, walls, moist mossy banks, under stones, &c.; of the Aquatic species, some are found on the sea shores, on the banks or margins of rivers, brooks, and ponds, but mostly in shallow waters, the whole are of very brittle substance, and exceedingly susceptible of injury. Some of the kinds are used as food; the species are very numerous, nearly seventy, being found in Great Britain.

30. *Nerita*. NERITE. Inhabitant a *Limax*.

Shell spiral, gibbous, somewhat flattened beneath; *aperture* semi-orbicular, with the *columella* uniformly strait. Plate 5, fig. 30. There are three divisions of this genus: * *Umbilicate*: ** *Imperforate*, with the lips toothless: *** *Imperforate*, with the lips toothed.

These shells inhabit the shores of the sea, rivers, and lakes, some are found adhering to sea-weed, pieces of wrecks, or other extraneous substances, others are only met with in deep waters, and may be taken in nets. Most of the kinds are exceedingly beautiful, and the animals are often eaten by the natives of the sea shores. The species are numerous, though but few are common to this country.

31. *Haliotis*. EAR-SHELL. Inhabitant a *Limax*.

Shell ear-shaped, open ; *spire* lateral, and nearly obscure ; *disk* longitudinally perforated with pores. Plate 5, fig. 31. The genus is divided into *Perforated* and *Imperforated*.

The species are all marine, and are generally found closely adhering to rocks or stones, within the influx of the tide, and it requires some adroitness to detach them without injury to their shells ; the animal is accounted delicate food. The species are not numerous, and we have only one indigenous to Great Britain.

DIVISION II.

SHELLS, WITHOUT A REGULAR SPIRE.

32. *Patella*, LIMPET. Inhabitant a *Slug*.

Shell conical, without any defined *spire*. Plate 5, fig. 32.

The genus consists of five families : * *Labiated*, or furnished with an internal lip : ** *Margin* angular, or

irregularly toothed : *** *Apex* recurved, pointed : ****
Entire, not pointed at the *Apex* : ***** *Apex* perforated.

Limpets abound on rocky coasts, and may be found in great abundance, adhering to rocks and stones; the fresh water species attach themselves to aquatic plants, they all affix themselves so tenaciously, that it is with difficulty they are removed without injury.

33. *Dentalium*. TOOTH-SHELL. Inhabitant a *Terrebellia*.

Shell nearly straight, slender, tubular, mostly pervious. Plate 5, fig. 33.

These shells are all marine, they may be found on sandy beaches at low water, generally in a perpendicular or oblique direction, beneath the sand or mud, and are discoverable by a slight depression on the surface.

34. *Serpula*. WORM-SHELL. Inhabitant a *Terrebellia*.

Shell slender, tubular, usually adhering to other substances, often divided internally by imperforate partitions, at irregular distances. Plate 5, fig. 34. There are two families in the genus : * *Flexuous*, irregular in shape, and adhering to other substances : ** assuming a determined form, and detached.

Like the last genus, these are confined to the ocean, and are often found in considerable numbers, attached to other shells, stones, and plants.

35. *Teredo*. SHIP-WORM, or PIERCER. Inhabitant a *Terre-bella*, or *Ascid*.

Shell tubular, tapering, slender, curved, one extremity closed by two hemispherical, and the other, by two lanceolate valves. Plate 5, fig. 35.

Though this genus is described as possessing valves, they are not of the nature of those of the Multivalve genera, the valves being rather parts of the animal than of the shell; this genus is extremely injurious to shipping, as they readily penetrate the hardest oak, as likewise posts or piles, that are emersed in water; they are confined to the ocean.

36. *Sabella*. CONCRETE-SHELL. Inhabitant various, as *Nerics*, *Amphitrite*, &c.

Shell or *case* tubular, composed of particles of sand, broken shells, and calcareous matter, cemented by a glutinous exudation. Plate 5, fig. 36.

It is not at present determined by the most able conchologists, whether this genus has a claim to its present situation among Testaceous shells, but as no better or more natural station has been assigned to them, we leave them as previously arranged. They are found in the sea, and also in fresh water ditches, sometimes affixed to rocks and shells, and at others, buried in the mud or sand.

ORDER IV.

ZOOPHYTA.—ZOOPHYTES.

This like the preceding order, has its characters taken from the tenements or habitations, and not from the Animal inhabitants. The order is divided into *Zoophytes*, which are soft and naked, and *Lythophytes*, which are covered with a hard coat.

Animals compound; efflorescing like vegetables.

1. *Tubipora*. TUBIPORE. Animal a *Nereis*; coral composed of erect, hollow, cylindrical, parallel tubes.
2. *Medrepora*. MADREPORE. Inhabitant a *Medusa*; coral with star-shaped cavities. There are five families of this genus, * *stars* single; ** with numerous separate *stars*, and continued *gills*; *** with numerous united *stars*; **** aggregate, undivided, with distinct *stars*, and porous, tuberculated, prominent undulations; ***** branched with distinct *stars*, and tuberculated porous undulations.
3. *Millepora*. MILLEPORE. Animal a *Polype* or *Hydra*; coral mostly branched, and covered with cylindrical pores.
4. *Cellepora*. CELLEPORE. Animal a *Polype* or *Hydra*; coral somewhat membranaceous, composed of round cells.

5. *Isis*. CORAL. Animal assuming a plant-like appearance; *stem* stony, jointed, the *joints* longitudinally striated, united by spongy or horny junctures, and covered by a soft cellular bark, the *cells* beset with oviparous *polypes*.
6. *Antipathes*. Animal growing in the form of a plant; *stem* expanding at the base, internally tough and horny, beset with small spines; externally covered with a gelatinous bark, covered with numerous *polype-bearing tubercles*.
7. *Gorgonia*. VENUS'S-FAN. Animal assuming a *plant-like* form; *stem* coriaceous, woody, horny or bony, composed of stone-like fibres, striated, tapering, dilated at the base; covered with a vascular or cellular bark, becoming when dry spongy and friable; the surface of the *stem* beset with *polype-bearing* mouths or florets.
8. *Alcyonium*. Animal plant-like; *stem* fixed, fleshy, gelatinous, spongy, or coriaceous, beset with *polype-bearing* stellate cells.
2. *Spongia*. SPONGE. Animal fixed, flexible, of various forms, composed of reticulated fibres, or masses of small spines interwoven together, and covered with a gelatinous flesh, full of small *mouths* on its surface, by means of which it absorbs and rejects water.
10. *Flustra*. HORNWRACK. Animal a *polype*, proceeding from porous *cells*; *stem* fixed, foliaceous, membranaceous, consisting of numerous rows of cells, united together, and interwoven like a mat.

11. *Tubularia*. *Stem* tubular, simple or branched, fixed by the base; animal proceeding from the extremity of the tube, and having its head crested with *tentacula*.
12. *Corallina*. CORALLINE. Animal in form of a plant; *stem* fixed, with calcareous subdivided branches, mostly jointed.
13. *Sertularia*. Animal as the last; *stem* branched, producing *polypes* from minute cup-shaped *cells*. Of this genus there are two families; * *stem* horny, tubular, affixed by the base, and furnished with *vesicles* or ovaries containing *polypes*, *eggs*, or living *young*; ** *stem* crustaceous, inclining to stone, composed of rows of *cells*; vesicles wanting, in lieu of which are small *globules*.
14. *Pennatula*. SEA-PEN. Animal not affixed, of various shapes, supported internally by a bony substance, naked at the base, the upper part with lateral ramifications; furnished with rows of tubular *denticles*, producing radiate *polypes* from each tube.
15. *Hydra*. POLYPE. Animal affixing itself by its base, linear, gelatinous, naked, contractile, and furnished with setaceous *tentacula*, inhabiting fresh waters, and producing its *deciduous offspring* from its sides.

ORDER V.

INFUSORIA.

The subjects of this order are all exceedingly minute, being for the most part only discoverable by the Microscope; they are found in stagnant waters, vegetable infusions, and are generally known by the term *Animalcules*. They are divisible into three families: * with *external organs*: ** without *external organs*, flattened: *** without *external organs*, round.

1. *Brachionus*. *Body* contractile, covered with a *shell*, and furnished at the head with ciliated *rotatory organs*.
2. *Vorticella*. *Body* contractile, naked, and furnished with ciliated *rotatory organs*; this genus is divided into three families; * animal affixed on a *stem* or *pedicle*; ** animal *tailed*; *** animal without *stem* or *tail*.

Most of this genus are so minute, as not to be discoverable without the aid of a lens.

3. *Trichoda*. *Animal* minute, pellucid, *hairy* or *horned*; there are two families in this genus, the one *hairy*, the other with *horn-like processes*. They are all microscopic objects, and invisible without the assistance of glasses.
4. *Cercaria*. *Animal* invisible to the naked eye; pellucid and *tailed*.

5. *Leucophra*. *Animal ciliated on every part : size as the last genus.*
6. *Gonium*. *Animal simple, flat, angular : size as the last.*
7. *Colpoda*. *Animal simple, pellucid, flat, sinuated : size as the last,*
8. *Paramecium*. *Animal simple, pellucid, flattened, oblong : size as the last.*
9. *Cyclidium*. *Animal orbicular or oval, simple, pellucid, flattened : size as the last.*
10. *Bursaria*. *Animal simple, membranous, hollow.*
11. *Vibrio*. *Animal simple, round, elongated : invisible without a Microscope.*
12. *Enchelis*. *Animal simple, cylindrical : size as the last.*
13. *Bacillaria*. *Body composed of cylindrical filaments, placed parallel to each other, and often changing their position.*
14. *Volvox*. *Animal simple, pellucid, spherical : invisible to the naked eye.*
15. *Monus*. *Animal of the most simple form, being a mere point, quite pellucid, and invisible without the aid of a good Microscope.*

Of the various genera comprising the class Vermes, but very few, compared with the whole, are convertible to the use of, and many of them are injurious to Mankind; of those applicable to our uses, some are consumed as food, the coats or shells of others are manufactured into articles of domestic use or ornament; some are used medicinally, and a few afford good dyes.

The various genera in the first and second orders, are only to be preserved in spiritous preparations, with the exception of the crustaceous ones, as the *Asteriæ*, *Echina*, and *Medusæ*; the mixture may be formed of one third pure colourless Spirit, and two thirds of solution of Burnt Allum; prepared as directed at page 153. The animals are instantly killed by emersion in pure spirit; and may then be placed in glasses or jars, with some number or mark of reference affixed; the shelled or crustaceous kinds, as soon as destroyed, should have the contents of their shells extracted, with some sharp-pointed instrument, care being taken not to injure any of the spines or appendages; the common mode practised by fishermen on the British coasts, is to plunge the animals into boiling water, but this method in most cases entirely destroys their natural colour; when the shells are emptied, they may be laid for some time in fresh water, to cleanse them from any impurities; and then gradually dried in the shade. The thin flexible species, as many of the Starfish, when cleaned and washed, may be dried between paper, and kept flat, should any of them in drying become curled, they may be restored to their proper or natural forms, by emersing them in cold fresh water, or wrapping them in wet cloths till they become flexible, when their proper attitudes may be recovered.

Most of the first order, are only discoverable on the dissection of other animals, and it would contribute to the advancement of science were their œconomy more fully known, but as they are subjects not very likely to come under the observation of the traveller, we shall pass them without further remark.

The testaceous order having attracted the attention of the curious, both on account of the singularity of structure, and beauty of colouring in the different species, we shall enter more fully into detail with respect to their capture and preservation.

Shells, as we have before remarked, inhabit the ocean, rivers, lakes, ponds, and some species reside on land; on capturing any, the most expeditious method of depriving the animal of life, is to emerse it in spirit of wine, after the animal is dead, the shell with its contents, may be placed in hot water for some time, by which, the body of the animal will become firm, and may easily be removed with any sharp instrument, care should be taken that the whole of the animal is extracted, as if any parts are left within the shell, on their becoming putrid, they often give out a stain which is injurious to the markings of the shells; if any difficulty is experienced in removing the whole of the body, the burying the shell for some hours in an Ant hill, will generally answer the purpose most effectually, as these little animals will consume every fleshy particle.

Of Multivalve and Bivalve shells, the different parts of the shell should all be carefully preserved, in these no diffi-

culty will arise in removing the inhabitant, as almost instantly the animal is dead the shells open, and their contents are easily extracted; the greatest attention should be observed not to injure either the hinge or teeth, as from the structure of these parts, the generic characters are principally founded; care should likewise be taken to preserve any beard or silky threads that may be attached, as these will often assist in making out the species.

In the brief sketch we have given of the habits of each genera, their haunts are mostly alluded to, some are only to be obtained accidentally, when detached from rocks situated beneath the depths of the ocean, others are found in rocky currents, or in shallows of four or five fathoms depth, many resort to the sands or mud on the beach, beneath the surface of which they retire as the water recedes, numerous kinds may be found attached to submarine rocks; most kinds are but of little worth, after being exposed on the beach to the sun and air; so that to have them in perfection, they should, if practicable, be obtained with their inhabitant alive; a Trawling or Dredge net, such as in common use with fishermen, will be found very useful, as by it many kinds can be obtained from deep water, which would otherwise only come accidentally to shore.

Many valuable shells may be found on the beach after violent storms, being removed or separated from their native beds by the agitations of the water; some kinds may be found affixed to the bottoms of ships that have been long stationed in warm climates, as also the stocks of anchors, cables, &c.

On obtaining any species containing the living animal, the particular genus to which the animal belongs should be noted, with its peculiarities of structure, as likewise whether frequenting deep waters, or shallows, if affixed to other substances, or detached, if it retires beneath the sand or slime of the beach, at low water, and such like particulars; if as the animal advances in age, any, and what changes take place in the appearance or structure of its dwelling; if it be useable as food, or affords any dye, and if the shell or shells are convertible to domestic or other purposes.

River shells, though not of such brilliant colours, often possess much interest, their localities are of the same kind as the marine species, and the same means are required to obtain them, their substance is usually thin, and they are very brittle.

Land shells are frequently of very beautiful colours, and are held in great estimation, they frequent moist mossy banks, shady lanes, and some of the kinds are only found on chalky situations; the terrestrial shells, or rather their inhabitants have the property of resisting the action of boiling water, for a considerable length of time, without receiving any material injury, so that the quickest mode to destroy the animals, is plunging them into spirit, either of wine or turpentine; the substance of Land shells is thin, and they are mostly brittle.

When the shells are clean, dry, and their contents completely removed, they should be wrapped separately in paper, and may then be packed in a box, with a quantity of

saw-dust, bran, or fine sand, so that all the interstices between the shells be filled up to prevent their rubbing one against the other, besides this precaution they require no other care.

A considerable variety of shells are fit for the cabinet, as soon as the animal is removed, possessing an extremely high natural polish when fished up, others are covered with an epidermis, which it is necessary to remove, to have a view of their colours, in some this is scabrous, laminated, or fibrous, in others it has the appearance of a fine close pile, like velvet; some kinds when taken, are covered with extraneous substances, as coralines, fuci, &c.; to remove these, the shells should be steeped in hot water, and suffered to remain therein for twenty-four hours, frequently adding boiling water thereto; when taken out they should be cleansed with a brush, but if the substances still adhere, the shells may be placed in some diluted acid, which will generally remove all adhering substances, the preparation should not exceed one eighth part of Muriatic acid mixed with water, and it will be necessary to observe that this does not act upon any part of the shell, but that requisite to be cleared, as the substance of all shells being calcareous, the action of the acid is injurious, and no acid should be used but in cases of necessity.

To remove the epidermis, the above named mixture will be found effective, it should be poured into a shallow saucer or plate, so that only a small part of the shell is acted on at one time, the shell should not be suffered to remain in it but a minute or two at most, without examination; it should then be taken out and put into cold water, and the surface

washed with a soft brush and soap, if the purpose is not effected, it may be placed in the acid again till the epidermis is removed ; but it would be well for all collectors to retain one specimen of each shell in its natural state.

When the shell is quite clean, it should be rubbed with flannel or a brush, with a little fine emery to polish the parts cleaned, or where the acid has accidentally suffered to get on the uncoated parts ; some persons use oil to rub over those shells that have been placed in the acid, and then rub them with flannel ; olive oil is also frequently used to rub over such shells as have a thin flakey epidermis, which prevents its peeling off, a circumstance that often happens to shells that have been long kept in cabinets.

Numbers of shells whose exterior is rough and unsightly, possess a great variety of rich colouring beneath the outside layers of the shell ; from which circumstance numerous impositions are practized on the young conchologist by dealers ; to guard against which it requires much skill, as damaged specimens are daily exposed for sale, so altered in form, as to appear belonging to different genera, by having their lips or hinges filed away or notched ; the young collector would do well first to possess himself of some well defined species of each genus, which will serve him to refer to in all difficult cases either of arrangement or in purchase. These may be obtained on reasonable terms of Mr. Mawe, in the Strand, whose collection abounds in rare and valuable specimens ; and where the young Conchologist will be sure to meet with useful information relating to this and the science of Mineralogy.


In collecting the next order in this class, the only caution necessary to be observed, is to procure the specimens as

entire as possible ; the animals may be killed instantly, by immersing the Madrapore, Coral, or Sponge, in spirits, and afterwards cleansing them in warm water ; in packing, they should be well secured from rubbing against each other ; as friction would completely destroy the shape of the pores ; each specimen should separately be enveloped in paper, and bran, saw-dust, or sand, may be used in packing them up, so that the case, or whatever may be used to pack them in, should be completely filled, and well shaken down, previous to the package being finally closed ; these are the only circumstances necessary to be attended to in packing. For the arrangement of these various genera, Cabinets offer the most convenient form for display, as likewise for the associating the nearly allied species ; their form must be left to the taste of the collector ; the drawers should be strong, and have glazed tops or lids, which will keep the specimens free from dust, and also prevent their being handled, which often occasions accidents.

Of the last order of this class we have before remarked, they being animals, of whose existance we should be entirely ignorant, were it not for the use of the Microscope, any instruction for their preservation must be useless ; to the Microscopic observer we may just add, that all stagnant and putrid waters abound with *Animalculæ*, particularly in the summer months ; they are also met with in numbers, in the juices of decaying animal and vegetable substances ; water in which vegetables have been boiled, and suffered to cool in the open air, will often, after the lapse of eight or ten hours, seem to become a living mass of *Animalculæ* ; to inspect them it is only necessary to place a single drop of the water in the concavity of a watch glass, and then place it under the magnifier.

BOTANY.

“Soft roll, your incense Herbs and Fruits and Flowers,
In mingled clouds, to Him whose power exalts ;
Whose breath perfumes you, and whose pencil paints.”



IF we derive as already stated, so considerable a proportion of the necessaries of life from the various classes of the Animal kingdom, we are infinitely more indebted to the Vegetable one, as it is from this source that the larger portion of the animal world is itself supported ; besides the food we derive from Vegetables, they form the basis of our dwellings, Agricultural and Mechanical Implements, and in fact, most of our domestic conveniences are obtained from the vegetable kingdom.

As it would encrease the size of this volume beyond that of a Pocket Companion, were we to detail the structure and peculiarities of each genus, as in the preceding classes, we shall content ourselves with giving such an outline of the different Classes and Orders of the Vegetable kingdom, as may enable a Tyro, on finding a plant, to discover its situation in the system.

Linnaeus, to whom we are indebted for the classification now in general use, divided plants into Twenty-four Classes, and further separated the classes into an equal number of Orders; the constituent characters of which we shall proceed to enumerate, premising that the characters of the first eleven classes as taken from the number of stamens or anthers; of the succeeding nine, from the number and situation of these parts, as also, whether they are distinct, or separate one from another, or connected by their filaments; the other classes are composed of Plants, which have the Stamiferous and Pistiliferous parts of the flower, either in distinct or on the same plant, or the stamens on one plant, and the pistils on another; and lastly, of such as have Stameniferous, Pistiliferous, and Neutral flowers, on the same, or separate plants.

The last Class is composed of plants possessing no characters in common either with each other, or with those of other classes; their fructification being little understood; the flowers or parts of fructification, in most kinds, are only discoverable by the Microscope, and the offices of these parts have not in many of the kinds been satisfactorily defined.

The characters of the first thirteen Orders are taken from the number of the Pistilla, or female parts of the flowers; of the succeeding orders, from the structure of the Pistilla, Pericarp (or seed vessel); from the proportion and situation of the Stamens, or from the disposition and character of their Florets. It is almost unnecessary to add, that the male parts of the flowers are the Anthers or Stamens, those yellow masses suspended on thread-like filaments, conspicuous in the Lilly, and the female is that slender projecting part with a green tip, likewise conspicuous in the Common White Lilly.

CLASSES.

ORDERS.

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| <p>1. MONANDRIA. This class consists of two orders. Flowers containing only <i>One stamen.</i></p> | } | <p><i>Monogynia, Dygynia.</i></p> |
| <p>2. DIANDRIA. This class consists of three orders. <i>Two stamens</i> in each flower.</p> | } | <p><i>Monogynia, Digynia, Trigynia.</i></p> |
| <p>3. TRIANDRIA. This class consists of three orders.—<i>Three stamens</i> in each flower.</p> | } | <p><i>Ditto Ditto Ditto.</i></p> |
| <p>4. TETRANDRIA. This class consists of three orders. <i>Four stamens</i> in each flower. The plants in this are to be distinguished from those in class XIV by their being all of the same length.</p> | } | <p><i>Ditto, Ditto, Ditto.</i></p> |
| <p>5. PENTANDRIA. This class consists of six orders. <i>Five stamens</i> in each flower.</p> | } | <p><i>Monogynia, Digynia, Trigynia, Tetragynia, Pentagynia, Polygynia.</i></p> |

CLASSES.

ORDERS.

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| <p>6. HEXANDRIA. This class consists of five orders. <i>Six stamens</i> in each flower. Distinguishable from the plants in class XVI by the stamens being all of equal length.</p> | } | <p><i>Monogynia, Dygynia, Trigynia, Tetragynia, Pentagynia.</i></p> |
| <p>7. HEPTANDRIA. This class consists of four orders. <i>Seven stamens</i> in each flower.</p> | } | <p><i>Monogynia, Digynia, Tetragynia, Heptagynia.</i></p> |
| <p>8. OCTANDRIA. This class contains four orders. <i>Eight stamens</i> in each flower.</p> | } | <p><i>Monogynia, Digynia, Trigynia, Tetragynia.</i></p> |
| <p>9. ENNEANDRIA. This class contains three orders.—<i>Nine stamens</i> in each flower.</p> | } | <p><i>Monogynia, Trigynia, Hexagynia.</i></p> |
| <p>10. DECANDRIA. This class contains five orders. <i>Ten stamens</i> in each flower. The plants of this are distinguishable from those belonging to class XVII, by the stamens being all separate.</p> | } | <p><i>Monogynia, Digynia, Trigynia, Pentagynia, Decagynia.</i></p> |

CLASSES.

ORDERS.

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| <p>11. DODECANDRIA. This class contains five orders. This consists of such flowers as bear from <i>Twelve</i> to <i>Nineteen stamens</i>.</p> | } | <p><i>Monogynia, Digynia, Trigynia, Pentagynia, Dodecagynia.</i></p> |
| <p>12. ICOSANDRIA. This class contains five orders. This class consists of such flowers as bear more than <i>Twelve stamens</i>, which are attached to the <i>Petals</i> or <i>Calyx</i>, and not to the receptacle. Not any of the plants belonging to this class are known to be poisonous; but many kinds produce edible fruits.</p> | } | <p><i>Monogynia, Digynia, Trigynia, Pentagynia, Polygynia.</i></p> |
| <p>13. POLYANDRIA. Seven orders in this class. <i>Stamens Twenty</i> to a <i>Thousand</i>, which are affixed to the <i>Receptacle</i>, in which respect they differ from the last class; as likewise being for the greater part poisonous.</p> | } | <p><i>Monogynia, Digynia, Trigynia, Tetragynia, Pentagynia, Hexagynia, Polygynia.</i></p> |

CLASSES.

ORDERS.

14. DIDYNAMIA. This class contains *two* orders.—*Stamens Four*, two on long and two on shorter filaments; from which circumstance the plants are readily distinguished from those of class IV.

Gymnospermia, in which the seeds, four in number, are naked, and placed at the bottom of the calyx; most of the plants in this order are aromatic, and may be eaten with safety:—*Angoispermia*, in which the seeds are numerous, and contained in a common pericarp, or seed vessel. Many of the plants in this order are poisonous.

15. TETRADYNAMIA. This class contains two orders.—*Stamens Six*, *Four long* and *Two short*, which distinguishes these plants from those of class VI.

Siliculosa, in which the seed vessel is a small round, inflated or flat pod: *Siliquosa*, seed vessel a long cylindrical or flattened pod.

The flowers of all this class produce four petals, which are placed crossways; and not any of them possess noxious qualities.

16. MONADELPHIA. This class contains eight orders.—*Stamens all connected by their filaments at the base*.

Triandria, *Pentandria*, *Heptandria*, *Octandria*, *Enneandria*, *Decandria*, *Dodecandria*, *Polyandria*.

CLASSES.

ORDERS.

- 17 **DIADELPHIA.** This class contains four orders.—
Stamens in two sets. All the plants of this class have Papilionaceous, or Butterfly-shaped flowers, which readily distinguishes them from those of class X. Not any of this class are known to be possessed of noxious qualities.

Pentandria, Hexandria, Octandria, Decandria.

18. **POLYDELPHIA.** This class contains four orders.—
Stamens in several detached bundles.

Decandria, Dodecandria, Icosandria, Polyandria.

19. **SYNGENESIA.** This class contains five orders. The flowers are all compound, that is, the common calyx contains a number of florets, which in the first order are all perfect: in the second order the florets of the disk are perfect, and those of the radius, only Pistiliferous: the third has the florets of the disk perfect, and those

Polygamia æqualis ; Polygamia superflua ; Polygamia frustranea ; Polygamia necessaria ; Polygamia segregata.

CLASSES.

of the radius without either Anther or Pistil: the fourth contains such plants as have the florets of the disk Stameniferous, and of the radius Pistileferous: the fifth and last order, is composed of plants producing many florets, all of which are contained in one common calyx, besides which each floret has one calyx peculiar to itself.

ORDERS.

20. GYNANDRIA. This class contains four orders, and is distinguished by the stamens growing on the pistil, or on a receptacle that supports both Stamens and Pistil.

Monandria, Diandria, Triandria, Hexandria.

21. MONÆCIA. This class contains eleven orders. The character of the class is, that not any of the flowers are perfect, but Stameniferous and Pistileferous flowers are produced on the same plant.

Monandria, Diandria, Triandria, Tetrandia, Pentandia, Hexandria, Heptandia, Polyandria, Monodelphia, Syngynesia, Gynandria.

CLASSES.

ORDERS.

22. **DIÆICA.** This class contains fourteen orders.—
The class is composed of such plants as produce Stameniferous flowers on one plant, and Pistiliferous ones on another.

Monandria, Diandria, Triandria, Tetrandria, Pentandria, Hexandria, Octandria, Enneandria, Decandria, Dodecandria, Polyandria, Monadelphia, Syngenesia, Gynandria.

23. **POLYGAMIA.** This class contains three orders. This class consists of such plants as produce Perfect flowers, as also Stameniferous and Pistiliferous flowers. In those of the first order, these three kinds of flowers are produced on one plant, in the second on two plants, and in the last order each kind is on a distinct plant.

Monœcia, Diœcia, Triœcia.

24. **CRYPTOGAMIA.** This class contains four orders.

Filices, Musci, Algæ, Fungi.

The distinguishing characters of this class are, that flowers are either wanting, or so exceedingly small as not to be discoverable to the eye, unassisted by the Microscope; and they are destitute of those parts considered as essential to the perfecting of Seed in the plants contained in the other classes.

Having briefly explained the classes and orders, we shall proceed to state what are the component parts of perfect plants, or such as produce flowers. The Root, which generally penetrates into the earth, from which it derives its nourishment, by absorbing moisture, &c., and by which the plant is fixed, and has stability ; the Stem or trunk, which in opposition to the root, is ascending, and mostly supports or produces the leaves and flowers. The parts comprising a complete or perfect flower, are, 1st, The Calyx or cup containing the flower, this, though mostly accompanying, is not essentially requisite to the producing perfect seed. 2nd, Corolla or Flower, this is what is usually known by the term flower, and is either composed of one entire, or of several parts or petals, is often beautifully coloured, and possesses an exquisite fragrance ; the corolla is not essential to the formation of perfect seed. 3rd, Anthers or Stamens, these are in the Linnean system considered as the male parts of flowers, and are necessary to the production of perfect seed. 4th, Pistil, this is considered as the female part of the plant, is placed on the summit of the seed vessel, and without it the flower is unproductive. 5th, Pericarpium or Seed Vessel, this is mostly the base of the Pistil, though not essential to the perfecting of seed. 6th, Seed, these contain the rudiments of the future plants, and are either contained in the Pericarp, or lie at the bottom of the Calyx. 7th, Receptacle or base, on which the parts of fructification are seated ; the first four of these parts pertain properly to the flower, and the remaining three to the fruit.

Plants are a kind of organized bodies, endued with certain perceptive properties, but destitute of the power of loco-

motion ; some flowers close on the approach of moisture, in others the leaves only possess this power ; many kinds fold or curl up the petals of their flowers at the close of the day, and expand them with the rising morn ; a large variety only expand their flowers in the middle of the day, and while the sun shines ; and should the season at which they usually bloom, be wet and cold, numbers never unfold their flowers, notwithstanding which their seed is perfected. As plants do not possess the power of moving from the spot where they first root, it would seem a circumstance of course, that their seed should produce abundance of the same kind all around the parent plant ; but this is by no means a constant occurrence ; the seed-vessels of many plants open with so great a degree of elasticity, as to throw their seed to a very considerable distance ; a large number of seeds are furnished with plumes or wing-like appendages, which when they are discharged from the pericarp, supports them in air, and they are wafted by every breath, till reaching some sheltered spot they vegetate, and form a new colony ; Numerous kinds of seeds are covered with pulpy substances, these are devoured by various kinds of birds, who, having digested the pulp, pass the seeds unconcocted, and as these have not had the vital principal impaired, they readily vegetate ; some kinds of seeds are provided with hooks, spines, or other appendages, which cause them to attach to the skins and furs of Animals, and they are by this means widely distributed.

It is observable that most plants that encrease greatly by their roots, do not produce much seed, and frequently what is produced is not perfect ; thus, though nature seems foiled in the one instance, the plant does not perish, as the roots of

such plants as encrease by bulbs or tubers, rarely fail of annually adding to the stock ; besides which numerous sorts grow from twigs, or small branches, which being broken from the parent, fall to the ground, where they soon root, and thus a succession is provided. Succulent plants possess the vital principle in so high a degree, that many will survive months, without earth or water ; the living principle is not in these confined to the root or the stem, but almost every part possesses it, so, that a single leaf laid on the ground, will soon root, and from it will rise a numerous progeny. Many parasitical plants, natives of hot climates possess this property in a very extraordinary way, we have known a tuberous leaf of a species of *Epidendrum*, brought from South America, suspended from the roof of a cabin by a thread, and in this manner arrive in England ; on the voyage it produced flowers, and at the time we saw it, a fresh spike of flowers was just appearing, from which a figure was afterwards given in one of the Botanical Periodical publications. This mode of conveying tubers is worthy of remembrance, as this tribe of vegetables being mostly parasitical, they are with difficulty preserved if placed in mould, when the latter mode is attempted, care should be taken to surround the tubers with pieces of bark, into which they will often root.

Some plants will retain their vegetative powers by being buried in dry sand, and kept from the air in a cool situation, as most Bulbs ; other kinds may be placed in damp Moss, first having the roots enveloped with moss so as to form a ball, and then completely covered with damp moss ; many cuttings of trees will bear transporting in this way ; succulent plants, as Aloes, Stapelias, *Mesembryanthemums*,

&c., should be suffered to dry for a few days, and may then be loosely packed in a box without moss; many of them will live in this state for four, six, or eight months.

In procuring the seeds of foreign plants, care should be taken that they are perfectly dry, they should be packed in coarse brown paper, with but few seeds in each parcel, and the different parcels stowed into small tin boxes or canisters, the lids or covers of which should be soldered or cemented on, the more effectually to avoid the attacks of insects, and the admission of air; such kinds of seeds as are encased in hard shells, do not require these precautions but the less all the sorts are exposed to the air, the more probability there will be of their vegetating. Various experiments have been made of substances to pack seeds in, as Sugar, Raisins, enveloping the seeds in warm wax, packing them in cerate papers, &c.; but the grand secret is to procure them sound and dry, and to pack them in such a manner as to exclude fresh air, which eventually dries up their juices; and what is of equal consequence, is, that the seeds be planted as soon as each parcel is opened, as one hours exposure being in many cases sufficient to destroy a whole package.

As we derive so much from vegetables; it behoves the Traveller and Philanthropist, to enquire and ascertain the properties of such as are in request in other countries, either for food or medicine, for the purpose of dyeing, or for mechanical or agricultural purposes; as practical information on these points may be of incalculable advantage. In pursuing enquiries relative to grain, culinary or esculent

vegetables, the times and seasons of planting, sowing, and reaping, should be carefully ascertained, as from the want of information of this kind we frequently lose the advantage that might otherwise accrue from the introduction of exotic plants. The particular soils and kinds of manure suitable or favourable to their increase, should also be noticed; as likewise what animals are particularly injurious to the crops, and what modes are adopted to prevent or repel their attacks.

The agricultural operations of foreign countries, well merit the particular attention of the Traveller, both with respect to the subjects cultivated, and to the purposes to which they are applicable; the quantities of seed apportioned to an acre of ground; the modes of sowing it; the average number of hands employed on any given quantity of land; the modes of weeding or cleansing the crops; of ploughing, harrowing, irrigating, scarifying, and paring of land, should likewise be ascertained; as also the plans of mowing, reaping, or otherwise collecting and housing the crops, with the particular methods practised for thrashing or freeing the various seeds from their husks or chaff, or for preparing any vegetable substances for manufacture, as Hemp, Flax, Cotton, &c. Answers to these queries will with great probability be attended with advantage. As the introduction of a vegetable of equal value with the Potatoe, would form an object of the highest national importance, Travellers cannot more essentially serve their country, than by ascertaining the kinds, and procuring seeds or plants of the various culinary or esculent vegetables, in use in other countries; as by their introduction, an addition will be made to our present stock of foodful plants, which is of far greater importance than the introduc-

tion of a whole forest of tropical flowers ; which though beautiful, and highly interesting, are still of comparatively trifling value. Of the timber trees common to other countries, their size, age of attaining maturity, and durability, should be ascertained, with the purposes to which from the texture of the wood they are applicable ; if for ship timber, for building, for agricultural or domestic purposes ; if capable of receiving a fine polish, or likely to be of use for the purpose of inlaying ; if any dye is afforded ; if the wood or bark is applied medicinally, and if so, how prepared, and administered ; if they produce nuts or seeds, useable as food, or for the purpose of extracting oil ; if the husk like that of the Cocoa Nut, is used for domestic purposes ; whether Pitch, Tar, Turpentine, Resin, or Gums of any kinds are naturally produced, or extracted ; if they afford Sugar, or from any natural or artificially caused exudation, a vinous or spirituous extract is afforded ; numerous other queries of this nature will probably arise in the mind of the observing Naturalist, which he will do well to have resolved, enough having been said in this place, to turn his attention to these subjects.

As a considerable difficulty arises in determining the particular species of Tree, without specimens of the wood, (we do not mean botanically) small pieces should be obtained, cut to one size, say six inches long, by three wide and thick, these being all of equal dimensions, will conveniently pack, and be of sufficient magnitude to ascertain their qualities, particularly the ornamental kinds ; when obtained, they should be suffered to dry gradually, and when perfectly so, may be coated over with varnish, which will mostly repel the attacks of insects.

Plants of peculiar interest, that are destined to be sent from abroad, should be chosen of small stature, in good health, and if practicable, should be inured to a greater variety of temperature, than in their natural state they are exposed to ; these should be taken up with a ball of earth adhering to their roots, and the ball enveloped in a thick coat of moss which should be tied over with pack-thread, or matting, as represented at fig. 1, Plate 7, they may then be placed in a case in cut moss, this should be packed closely round the balls of earth, and covered over the tops of the roots two or three inches deep ; the surface of the moss should be netted over with stout string or cord ; the case may be placed on the deck of the vessel, in as airy a situation as possible, but where it is not likely to be splashed with the spray of the sea, as this, if it falls on the leaves or stems of the plants, is very injurious, from the salts crystalizing in dry weather, and in damp weather being decomposed by the humidity of the atmosphere : the case should have the two ends open, and covered with wire or strong netting, which as occasion requires may be further sheltered by pieces of boards or canvas ; the lid of the case should be made to shut like that of a common box ; which in heavy rains, will prevent the plants from receiving a superabundance of water, and in dry warm weather, will admit a larger portion of air. As it is not at all times practicable to get cases made in the form above recommended, a cask may easily be converted into a proper form for the conveyance of living plants, as represented at fig. 2, Plate 8.

In inclement seasons, when opportunity offers for constructing a case peculiarly adapted for the purpose,

specimens may be packed as recommended, in a close case or box, as at fig. 1, Plate 8, with small apertures for the admission of light and air, during severe or wet weather, as at *b*, *c*, *d*, the part marked A should be made to slide out, and this ought to be done at every opportunity, that the plants may enjoy the advantage of a free circulation of air, as likewise the lid thrown open ; in fact, this may be considered as fig. 1, Plate 7, when shut down in tempestuous weather.

The Boxes figured 6, 7, 8, Plate 6, are calculated for the planting of such Bulbs or Seeds, as are not likely to outlive a long voyage, if not planted or sown ; fig. 6, represents the Box, previous to the plants or seeds being placed therein, fig. 7, the Box hooped, and fig. 8, covered with netting, which in rainy weather should be further protected with canvas or matting.

In short voyages, some plants will merely require to be each packed in a separate paper, and be kept quite dry ; some of the Orchideæ will survive for six weeks or two months, if taken up with what earth may adhere to their roots, and packed in dry straw, in a close box, all this family transplant best after the flower spike appears, the Bulb for the succeeding season being then formed, and they are not so susceptible of injury from that time till the bloom goes off, as at any other period.

As it will be a matter of risk whether the plants (with all the care that can be bestowed on ship-board,) survive the voyage, the Traveller should carefully collect seeds of all the kinds he can obtain ; as likewise specimens of the plants

in a flowering state, which should be dried, and the particulars annexed. The plan we have adopted, is to collect the specimens in as perfect flowering state as can be procured; these must be gathered on a dry day, and placed in a common tin vasculum or pocket herborizing Box, as collected, and secluded as much as possible from the air, on returning home the plants should be carefully spread upon paper, and covered with a few sheets of common blotting paper and placed under some small degree of pressure, after the plants have remained in this state for twenty-four hours, the papers should be examined to observe if any of the leaves or flowers are in a distorted or unnatural position, as they will at this time be perfectly flexile, and can easily be restored to a natural position, they should be again covered with blotting paper, and the plants gently smoothed with a heated flat iron, such as used for domestic purposes; this may be repeated till they are quite dry, when they may be finally placed between paper, and all the particulars relative to each written on the opposite page. Such plants as are evergreens, or succulent, will retain their foliage better if previously to drying they are immersed in boiling water, and then carefully dried, as by this method the vital principle will be destroyed, which often occasions the leaves to fall off, by an effort to produce new ones.

All flowers of a harsh, thick or woody texture, as many of the Proteas, &c, should have the under side of the flowers cut away, by which means they will be more portable, and give a more correct portrait of the living plant. Mosses only require to be placed between paper, with but little pressure; Lichens only to be dried in the shade

without any pressure. Conferva require to be expanded in a shallow dish of clear fresh water, and the paper they are intended to be placed on, should be introduced beneath them, when they will generally adhere without further care, and only require to be dried to be fit to place in the herbarium. Fuci or Sea-weed, should be well rinsed in clear fresh water, the larger kinds suffered to remain therein for some hours, to extract the saline particles, after which they will most readily (the fine leaved sorts in particular,) be displayed on paper in the manner already mentioned for Conferva. The Fungi are generally best preserved in a pickle, which may be made as follows : “ To two ounces of vitriol of copper reduced to powder, pour a tea-cup of cold water, stir them with a piece of stick or a quill for about one minute, then pour off the water and throw it away. On the remaining vitriol pour a pint of boiling water, and when the whole is dissolved and grown cool, add to it half a-pint of rectified Spirit of Wine; filtre it through paper; keep it in a bottle closely corked and call it PICKLE; to eight pints of pure spring water, add one pint and a-half of rectified Spirit of Wine: keep this in corked bottles, and call it the STRONGER LIQUOR.

To eight pints more water add one pint of Spirit of Wine, and call this the WEAKER LIQUOR.

Whatever Fungus you wish to preserve, should be suffered to lie upon your table, as long as it can be trusted without danger of decaying, so as to allow some of its moisture to evaporate, the thick and fleshy ones should lie the longest,

but the deliquescent ones, and those which are very thin and delicate should be put into pickle almost immediately after they are gathered.

Pour some of the PICKLE into a spare jar, and into this immerge the specimens to be preserved; they should be suffered to remain therein from three hours to three days, according to their bulk and fleshiness; then remove them into separate jars, each suited to the size of the specimen; if they are large and juicy, fill up the jar with the STRONGER LIQUOR; the WEAKER will suffice for the smaller and weaker plants; whichever liquor is used the jar must be quite filled with it, and immediately corked tight; cover the cork and top of the jar with venice turpentine, or with common oil paint, and when this is dry, cover the top of the jar with a piece of wetted bladder: these precautions are necessary to prevent the access of air, and the evaporation of the liquor, because if either of these happen, the specimens will soon be spoiled. The Boleti are generally more difficult to preserve than the Agarics, and such of either as abound with a milky juice, are apt to foul the liquor, which must then be changed. Mosses and Lichens may be preserved in great perfection by this method of pickling, as likewise many flowers of a thick, fleshy, or succulent nature, and most kinds of soft fruits." *Linnean Transactions*, vol. 2, p. 263.

Dried collections of plants are particularly subject to the attacks of insects, which often destroy valuable herbariums, to avert their attacks, Sir James Edward Smith, (in a letter to Mr. C. König, inserted in *Annals of Botany*, vol. 2, p. 194,) recommends a solution of corrosive sublimate of

Mercury, in Spirit of Wine. With this the learned President of the Linnean Society, washed his whole collection, and remarks, that since he so did, he has not seen any appearance of insects in the collection : the proportion is about two drachms to a pint, to which may be added a little Camphor : the liquor should be applied with a Camel-hair pencil, as lightly as possible ; the receptacles of compound flowers, and the more fleshy parts of plants should be saturated with it. The colours of plants are greatly revived by this application, and Sir J. Smith remarks he does not find any that are injured by it. This preparation he also recommends to preserve collections of Insects, Birds, Fruits, and Fungi.

The most convenient form for a herborizing box is the one represented at fig. 2, Plate 7, it will be found an improvement on the general form, to have one end of the box to draw off, by which larger specimens can be admitted without risk of breaking. Both the in and out sides should be japanned, to prevent their rusting ; and the lid must be made to fit as close as possible, for the purpose of excluding air.

In making drawings or descriptions of plants, the following particulars should be most carefully attended to. The form of the root, as fibrous, bulbous, tuberous, granulated, or spindle shaped ; the form of the stems or trunks in Trees, of stalks in herbaceous or shrubby Plants, if they be simple or branched, smooth, woolly, or hairy, if the hairs incline upwards or downward ; the shape and texture of the leaves, whether sessile, or furnished with footstalks, whether they be simple or compound, if flat, cylin-

dricul, concave, convex, smooth, rough, hairy, woolly, spinous, or furnished with tubular spines, by which a poisonous fluid is discharged, as in the Common Nettle; if the edges are entire, or serrated, if surrounded by a margin; the position they grow in should likewise be noticed, whether from the crown of the root or from the trunk, stems, or stalks, if they grow singly or in pairs, threes, &c., or in whorls; their relative position one to another, if opposite, alternate, or irregular; these particulars merit the closest attention, as they are those which often afford the best specific characters; if there be any Bractæ or floral leaves, if these differ in form or colour from the other leaves; the form, duration, texture, or absence of the Calix; as also the same particulars relative to the petals in the Corolla; the number, situation, and form of the Stamens, Pistils, Seed Vessel, and Seed; by attending to these, much useful information will naturally accrue, and the dissemination of the particular structure of the parts common to each plant, as growing in its native or wild state, will tend greatly to the removal of difficulties with which many exotic species are encumbered.

The Philosophy of Botany, like that of every other branch of Natural History, does not consist in forming extensive collections, or in acquiring a scientific acquaintance with the nomenclature of the various species; but in ascertaining their uses, qualities, and relations as respects other subjects, and their own peculiar æconomy and history; it is these particulars that give interest to this and every other science, and are those that a true Naturalist will ever have in view; in contemplating the varied

productions of the fields or gardens, he will find nothing cloying, nothing affecting his passions, or causing those unpleasant feelings so often excited by the works of art, for truly as Lord Bacon observed, 'a garden is the purest of all human pleasures;' the wonderful variety evident in the Botanical creation, in form, structure, colour, and œconomy, their powers of secretion of matter totally different from that from which they draw their nutriment; as Sugars, Salts, Acids, Bitters, &c. are all objects of admiration, and powerfully bespeak the wisdom and providence of their all-wise Creator.

We annex the sketch of a Botanical register, of such particulars as should in all possible cases be obtained; we have done this without reference to any known species; but merely that the various particulars relative to the use to which different species are applicable, may not be omitted.

MINERALOGY.

MINERALS are the last class, and compose the lowest link in the chain of organized bodies, they are divisible into Earths, Alkalies, the two bases of combustion, Sulphur, and Carbon, and Metals, the various combinations of which form that variety so abundantly produced in this department of Natural History. On the first view of this science, it would seem one of the least attractive, but a closer inspection soon discovers it to be of the highest importance, and that from the fairest Diamond or most brilliant Ruby, down to the commonest Sand or Gravel of our foot-paths, all merit our closest attention; as they individually contribute to our conveniences; some conduce largely to our domestic comforts and commercial advantages in the form of Fuel, as the various kinds of Coal; others are useable for Medicinal purposes, as Sulphur, Arsenic, Mercury, &c.; of the Metals, Man has availed himself, and with these, aided by the assistance of fire, is enabled to reduce the other parts of the Creation to his use and purposes.

It would be foreign to our plan, to enter at large into this highly useful Science, we shall therefore only slightly

glance at the various subjects most likely to arrest the attention of the Traveller ; and point out under the different heads, those places in which, or under what circumstances, the various Minerals are usually found ; and shall for further information refer the Mineralogical Student, to various valuable elementary works on the subject, but most particularly to the following. Aiken's Manual, Phillips's Introduction to Mineralogy, and his Outlines of Geology, and the Transactions of the Geological Society.

The various subjects of this science are composed of Nine Earths ; Two Alkalies ; Twenty-seven Metals : besides the two bases of combustible bodies, Carbon and Sulphur ; the various Acids, Water, Oxygen, and Hydrogen, all of which are included in the component parts of most of the other substances. The number of Acids are Thirteen, their names are derived generally from the substance or base from which the acid is formed ; *Molybdic, Arsenic, Chromic, Tungstic, Carbonic, Sulphuric, Phosphoric, Fluoric, Boracic, Nitric, Muriatic, Succinic*, and *Mellitic*, the bases of the two last are unknown.

EARTHY MINERALS.

1. **SILEX.** When pure, this is perfectly white and infusible, except by the heat of a Voltaic battery.

It is the most abundant of all Mineral substances, and enters into the composition of nearly two thirds of all known earthy Minerals. It is the principal ingredient in what are commonly known as Flints ; but it is found most fine in Quartz

or Rock Crystal ; some of the combinations of Silix, are among the more valuable of precious stones, as the Amethyst, Garnet, Opal, Agate, Lapis Lazuli, &c. All these varieties are met with either singly or in veins in mountainous countries, frequent occurring in Mines of various Metals, as Tin, Lead, Copper, &c.

2. **ALUMINE.** Is when pure, perfectly white, and without taste or smell ; like the preceeding, it is infusible except by Voltaic electricity.

Alumine enters into the composition of a large number of Mineral substances, and is the base of Common Alum ; its presence may mostly be detected by an odour which the earthy substances with which it is combined, give out when breathed upon, and which is usually termed the Argillaceous odour, from Argilla, the Latin term for Clay, of which Alumine is often a principal part. Alumine enters into the composition of several stones in considerable estimation, as the Oriental Ruby, Sapphire, Topaze, &c.

3. **LIME.** In a natural state its colour is whitish, somewhat hard, infusible except by the Voltaic battery ; it enters into the composition of numerous earthy and stony substances ; but has never been found pure.

The various combinations of Lime are among the most valuable, if not superior to all minerals as affording substances of infinite importance to the Agriculturist, the Manufacturer, and the Builder ; for general purposes Lime is obtained by heat from a variety of Carbonates.

4. **MAGNESIA.** This earth is light, tasteless, of a perfectly white colour, and like the preceding, is infusible except by Voltaic electricity.

This is not so abundant as the preceding earths, but is found in the composition of several earthy, as well as metaliferous substances. Native Magnesia which produces this mineral in its purest state, is a substance of rare occurrence, and has only been met with in New Jersey.

5. **ZIRCON.** Is white, tasteless, rough to the touch, insoluble in water, and infusible except as the preceding.

This earth is but sparingly found; and is at present only known to enter into the composition of three substances, the Hyacinth, the Jargoon, and the Zirconite; all of which are occasionally used by Jewellers.

6. **GLUCINE.** When pure this is white, soft, unctuous to the touch, and of a sweet taste, from which circumstance it derives its name.

Glucine has only been detected in combination with other substances. The Euclase, Aquamarine, Emerald, and Gadolinite; these Minerals though not abundant, are occasionally found in mountainous countries.

7. **YTTRIA.** This earth possesses several properties in common with the last, like which it has a sweetish taste; but it is five times, whilst Glucine is only three times heavier than water.

Yttria enters into the composition of the Gadolinite; a Mineral only found at Ytterby, in Sweden.

8. **BARYTES.** This, which has frequently been considered as an Alkaline earth, is when pure, white, ponderous, and has a sharp acrid taste, and is a violent poison.

Barytes has never been met with pure, is not abundant, and only enters into the composition of two or three earthy substances; these are the Witherite, Heavy Spar, and Hepatite: all natives of this country.

9. **STRONTIAN.** Like the last this Mineral has a considerable affinity to the Alkalies; when pure it is white, and its taste and properties resemble those of Barytes.

This earth is of rare occurrence, and is only known combined with one or two earthy substances, never having been found pure.

ALKALINE MINERALS.

These are found combined with earthy substances and Acids, but do not enter into the composition of Metals. The taste of all the Alkalies is acrid and nauseous, nearly resembling Barytes, and Strontian; with which they also further agree in their chemical properties. Alkali is an Arabic word, applied to the residuum of a plant called **Kali**, which is burnt for the purpose of obtaining the Saline ashes, with which it abounds; some Alkalies are termed *fixed*, in contra-distinction to such as are *volatile*.

1. **POTASH.** This substance is obtained from the ashes of such plants as do not grow within the influence, or are not contiguous to the sea; its base is allied in some respects to the Metals, it somewhat resembles Quick-Silver, but is lighter than water; and is combined with Oxygen.

Potash is abundantly obtained from various vegetables; it is also found in a considerable number of earthy substances, and enters into the composition of some of the oldest of the primitive Rocks, it is likewise found combined with Soda: Potash combined with Nitric Acid, forms that useful and well-known substance, Nitre, or Salt-Petre.

2. **SODA.** The base of Soda resembles silver, it is lighter than water, and is combined with Oxygen.

This substance is found combined with several Earthy Minerals, as also with Potash; it is exceedingly abundant, being the basis of common Salt, and is the saline residue of most plants growing on the sea shore.

METALS.

Metals having never been decomposed, are supposed when pure to be simple substances. The number of known Metals are Twenty-seven, they are found in a native state, either simple, consisting of only one substance; or compound, when composed of two or more substances. All the Metals are much heavier than the Earths, the heaviest of the latter not exceeding five times the weight of water; and the lightest of the Metals being six times heavier than water. Those

Metals that are capable of extention by being beaten with the hammer, are termed Malleable, and those which do not possess this property are called Brittle ; the Malleability of Metals add greatly to their usefulness, and being fusible, Man is enabled to free them from earths and extraneous substances ; without these properties he could hardly reduce them to his service.

MALLEABLE METALS.

1. **PLATINA.** This is the heaviest of Metals, being Twenty-three times heavier than Water ; its colour is a dull tin white ; it is capable of great extention, but is difficult of fusion ; in hardness it nearly equals Iron.

This Metal is principally confined to South America, it is usually found in small grains, mostly in the vicinity of the Gold Mines ; it is met with alloyed with Magnetic Iron, Gold, Copper, Lead, and several other Metals.

2. **GOLD.** Is Nineteen times heavier than water, is very soft, ductile, and flexible ; its colour varies from pale yellow, to deep orange ; it is capable of great extention, and its tenacity is very great.

Gold is generally mixed with some other Metal, as Tin, Copper, Silver, &c. ; it is found in veins, in the beds and sands of Rivers and Mountain streams, in several parts of Europe, Asia, Africa, and America ; from South America we obtain the greater part of the Gold now in use, it occurs in small grains, or lumps from the weight of a few

grains to fifty pounds ; it sometimes, though but rarely occurs in this kingdom, as also in Ireland ; the Gold Coin current in Great Britain, is composed of Twenty-two parts of Gold, and two of Copper.

3. SILVER. In a pure state is ten times heavier than water ; is soft, opaque, and flexible, it is white, shining, and very malleable.

Silver is more abundant than Gold, being dispersed through most countries, it occurs in a pure state, as also combined with Copper, Lead, and other Metals. English coin contains fifteen parts of Silver, to one of Copper ; the purposes to which this Metal is applicable, are too well known to require repetition.

4. MERCURY or QUICKSILVER. Mercury is thirteen times heavier than water ; it generally occurs in a pure state, and also combined with Silver, which it resembles in colour, but the peculiarity which distinguishes it from other Metals, is the fluidity it preserves at the common temperature of the Atmosphere.

This is less abundant than the last, the uses to which it is applicable in Medicine, the Arts, and Experimental Philosophy, are numerous ; and it is highly valuable in the separation of Gold and Silver from their Ores, which process is termed Amalgamation.

6. LEAD. Is of a blueish grey colour ; it is upwards of eleven times heavier than water ; is soft, malleable, ductile, but inelastic.

Next to Iron, Lead is the most extensively dispersed, and is one of the most abundant of Metals; it has never been found pure, but mostly combined with Iron, Manganese, Antimony, Silver, or their Ores. The Lead used for common purposes is obtained from an Ore called Galena, or Sulphuret of Lead, which is composed of Lead, Sulphur, Oxyde of Iron, and Silver, and sometimes it contains Lime and Silica. Among the various uses to which it is applied, is the glazing Earthenware; the Oxyde of Lead is used in making Glass; and combined with one fifth part of Antimony, it forms the types used in printing.

6. **COPPER.** When pure, Copper is about eight times heavier than water; its colour is a yellowish red; it is exceedingly sonorous, is harder than Silver; and in respect to fusibility is between Gold and Iron.

Copper in point of usefulness yields only to Iron, it is widely dispersed, being found pure, and also combined with various mineral substances; it is used as already observed, for alloying Gold and Silver; Copper alloyed with Zinc, forms Brass, Pinch-Beck, and Tinsel; with a small proportion of Tin it forms Bell-Metal; two-thirds of Copper and one of Tin, are used in forming the speculums in reflecting Telescopes; Copper filings, or plates oxydized by acetous acid, forms into green crystals, which are used in painting, under the name of Verdégrease or Verdigris.

7. **TIN.** This Metal has never been found pure, being generally combined with Copper, Sulphur, Iron, &c. it is about seven times heavier than water. Tin is the

lightest of the ductile Metals, it is harder and more tenacious than Lead, and is very fusible

Tin is used as an alloy with various other Metals, it is formed into exceedingly thin plates or leaves, under the name of Tin-foil, and this combined with Mercury, is used for silvering the backs of Mirrors and Looking Glasses. Tin is also used for the purpose of lining Copper vessels for domestic purposes, this is done by heating the vessels, having previously scraped the inside with an Iron instrument, and then rubbing the internal surface with Sal Ammoniac, when the vessel is quite hot a small quantity of Pitch or Resin, is thrown in and suffered to spread entirely over the internal surface, which completely prevents the Copper from oxydizing, as Tin will not combine with oxyde of Copper; when these preparatory measures are taken, a piece of pure tin is applied all over the inside of the hot Copper vessel, which instantly assumes a bright silvery whiteness, and prevents any unpleasant effects in using Tinned Copper vessels for culinary purposes.

Most of the Saucepans &c., used for kitchen purposes, under the name of Tin ware, are formed of thin plates of Iron, coated with Tin, these are first scoured, and then thrown into a solution of sulphuric acid, which destroys all the rust or oxyde, and renders the surface perfectly clear; the plates are then dipped into melted Tin, the surface of which is covered with oil or fat to keep it from the action of the air, by these means the Iron coming in contact with the pure melted Tin, it comes out completely coated; the Tin frequently penetrating the substance of the Iron.

8. **IRON.** This is one of, if not the most abundant of all Metals, being found in almost every rock and soil; it is about seven times heavier than water, of a blueish or reddish grey colour, is hard, ductile, and malleable, and in tenacity is next to gold.

Iron is found combined with numerous minerals, and forms a principal part of those substances known under the name of Meteoric Stones; it is Magnetic, and so easily is this property imparted to Iron, that a bar placed in a vertical position for a considerable time acquires polarity, which may also be communicated to it by suddenly striking it at the point against any hard substance; for instance, if a common poker be struck forcibly on a hearth, the point of contact becomes polar. The uses of Iron are numerous, and are so well known as not to require repetition; without it Man could hardly subsist in a civilized state, as it forms the principal parts of his Agricultural, Domestic and Mechanical Implements.

9. **ZINC.** Is about seven times heavier than water; it is of a colour between Silver and Lead; is hard, but not so ductile as some of the preceding Metals.

Zinc is less abundant than most of the foregoing Metals, it has not been met with pure, being either mineralized with Sulphur, or combined with Oxyde of Iron, Silex, &c. It enters into many alloys, preparations of it also are used for Medicine, and in the Arts.

10. **PALLADIUM.** When pure it is eleven times heavier than water; it resembles Platina in colour, is very malleable, and equal in hardness to Bar Iron.

This Metal is generally obtained in small quantities, alloying native platina. Native Palladium is infusible.

11. NICKEL. The specific gravity of Nickel is about nine, its colour is yellowish white, it is ductile, malleable, and possesses the magnetic property, though in a less degree than Iron.

Nickel has been found combined with Iron and other substances, and enters into the composition of all the Meteoric stones, which have fallen from the atmosphere, in this and various other countries ; its uses are principally confined to alloys.

BRITTLE METALS.

12. ARSENIC. Specific gravity nearly eight ; colour bluish or greenish white ; becoming on exposure to the air dark, almost black ; its substance is exceedingly brittle ; it occurs nearly pure, and also combined with Gold, Silver, Iron, Lead, &c.

Arsenic is one of the most active of Mineral poisons ; it is of frequent occurrence ; is used in glazing porcelain, and the manufacture of glass ; when combined with sulphur in certain proportions, it is either the Realgar or Orpiment used by Painters. Its presence may be detected by submitting it to the action of heat, or striking it with a hammer, when it gives out a garlic like smell ; it is also remarkable that the same appearance is produced on Silver and Steel, by the

application of Arsenic, as by the application of Onion or Garlic.

13. **ANTIMONY.** This Metal is of a dull whitish colour, of a brittle and compact substance, and is about six times heavier than water.

Antimony is a Metal frequently used in various arts ; as we before remarked, it forms one fifth of the composition of Printing Types, it is used in Medicine, and for alloys with other Metals ; it occurs combined with Arsenic, Silver, Iron, Sulphur, &c.

14. **BISMUTH.** Pure Bismuth is of a white colour, tinged with red ; its substance is brittle, and it is nearly eleven times heavier than water.

This is not abundant ; in its native state it is mostly alloyed with Arsenic, it is also found combined in the Ores of Silver, Iron, Cobalt, and Zinc ; the principal use made of this Metal is for alloys, also as an ingredient in soft Solders ; being one of the most fusible of Metals ; a preparation of Bismuth is sometimes used by Painters in water colours ; on paper it has a bluish tinge, but like Arsenic becomes blackish on exposure to the Air ; and particularly if the air be impregnated with any fæted or offensive effluvia.

15. **COBALT.** The weight of this Metal is about eight times that of water ; its colour is grey with a tinge of red ; and it is very difficult of fusion.

Cobalt is not found pure ; its Ores being sometimes combined with Arsenic and Sulphur, or Arsenic and Iron, and accompanying the Ores of Copper, Silver, Arsenic, and Bismuth. It is brought to this country reduced to an Oxyde, of a most brilliant blue colour, called Zaffre, which when melted with three parts of Sand and one of Potash, forms blue glass ; this reduced to a fine powder is known by the name of Smalts, and is used for giving a blue tinge to various substances, as paper, cloth, linen, muslin, &c. ; likewise in painting on porcelain, and also in oil and water.

16. **MANGANESE.** Manganese is about seven times heavier than water ; its colour is a rusty grey ; it is brittle, in a slight degree malleable, and is never found pure.

The Ores of this Metal are frequently met with in mineral countries, and in a state of Oxyde is found combined with a very considerable number of earthy and Mineral substances ; the black Oxyde of Manganese affords all the Oxygen used by the Chemist, and likewise the Oxygen in the composition of the Oxymuriatic Acid, so essential to the bleacheries of Europe. It is also used in glass making, and a beautiful violet colour is obtained from it, which is employed in painting porcelain.

17. **TELLURIUM.** This is a rare Metal, it is about six times heavier than water ; is very fusible, brittle, and of the colour of tin.

Tellurium is found in a Metallic state, but always alloyed by some other Metal, as Gold, Lead, Copper, &c.

18. **TITANIUM.** This Metal is of a reddish Copper colour, and so extremely difficult of fusion, that attempts to reduce it to a pure Metallic state, have rarely succeeded.

It is found combined with oxyde of Iron, Manganese, Silix, &c.; it was formerly employed in painting on porcelain, but has fallen into disuse from the want of uniformity in its colour.

19. **TANTALIUM.** This is a very rare Metal, it is about six times heavier than water, its external has a slight Metallic lustre, but the interior is dull and nearly black.

Tantalium has only been found in Sweden and Finland, combined with the oxydes of Iron and Manganese, as also with the rare earth Yttria.

20. **MOLYBDENA.** Like the last this is exceedingly rare, has never been found pure, and is with difficulty reduced to a pure state, having only been obtained in brittle infusible grains.

It is found in a Mineral state combined with Sulphur, and in the Acid state with Lead.

21. **TUNGSTEN.** This is a hard, brittle, granular Metal, of a light steel grey colour, and brilliant Metallic lustre.

It is found combined with oxyde of Iron, Manganese, and Silix, and occurs in most places abounding with Tin; it has

been used with other substances in the formation of red colours known by the name of Lakes.

22. **CHROME.** This substance has never been found in a Metallic state, only entering into the composition of some few substances; the Emerald is supposed to owe its brilliant green colour to its combination with this rare Metal.

23. **RHODIUM.** This Metal is not malleable, it possesses a bright Metallic lustre, and is about eleven times heavier than water.

24. **OSMIUM.** Is of a dark grey colour.

25. **IRIDIUM.** When pure is white and infusible. The three last named Metals are very rare, having only been found alloying the native Platina of Peru, and have not been applied to any useful purpose.

26. **URANIUM.** Has never been found in a Metallic state; its colour is dark grey, its substance is brittle, and may be cut with a knife; it is the lightest of all Metals excepting Tellurium, being only six times heavier than water. It has not been applied to any use.

27. **CERIUM.** This like the last has never been found in a Metallic state, and has only been obtained with considerable difficulty by the Chemist it enters into the composition of a few rare Minerals.

COMBUSTIBLE MINERALS.

Combustibles form a class of substances of properties peculiar to themselves, but possessing in common only the property of combustion; the bases of combustion, as we before remarked, are two, Sulphur and Carbon.

SULPHUR is a soft brittle substance, of a pale greenish yellow colour; it is found in masses, sometimes in veins, and at others in large beds; it is obtained from the Animal and Vegetable as well as Mineral Kingdom.

The uses to which Sulphur is applied are various, and so well known as not to require enumerating; it is highly inflammable, and is about twice the weight of water; it gives out an odour peculiar to itself when rubbed; it burns with a blue flame, and the vapour it exhales when ignited, is particularly injurious to animal life.

CARBON. The Diamond, which is considered as the hardest substance yet discovered, is capable of being completely dissipated; if heated to the temperature of Molten Copper, and subjected to a current of air, it becomes gradually but completely combustible, by which process it may be entirely converted into Carbonic Acid.

Diamonds are the most valuable of Mineral productions, and are in great estimation for ornamental Jewellery, as likewise for the purpose of cutting Glass, and they are used by Lapidaries to engrave the harder gems. Carbon is obtained from Charcoal in almost as pure a state as from the Diamond, but it is always accompanied with either Hydrogen or Water. Diamonds are found in India, South America, the Isle of Borneo, &c, they frequently occur in veins, or among the sand of rivers.

The two foregoing substances, Sulphur and Carbon, in greater or lesser proportion, enter into the composition of all combustible Minerals ; Plumbago or Black Lead is composed of ninety parts of Carbon, it is of a glistening metallic lustre, unctuous to the touch, soft and not very brittle, the principal use to which it is applied is the manufacture of those Pencils generally known by the name of Black Lead Pencils ; a name probably derived from the lead coloured mark they leave upon paper : but no lead enters into the composition ; it is about twice as heavy as water ; and cannot support combustion by itself. Naptha is a combustible substance which with Petroleum are comprehended under the term of Mineral Oil ; they are both liquid, highly inflammable, and lighter than water ; Naptha is transparent and almost colourless, it burns with a blue flame, gives out much smoke, and a penetrating odour when burning, and does not leave any residuum.

Petroleum, is of a substance somewhat thicker than common Tar, of a reddish brown colour, it possesses a strong, unpleasant odour, burns with a thick black smoke and leaves a residue like common black coal. It is found in various

places in England, and other parts of Europe, as also in Asia, and America. Naptha when exposed to the light and air becomes coloured, thickens, and nearly resembles Petroleum ; on distilling Petroleum, an Oil is obtained resembling Naptha.

Bitumen or Mineral Pitch, is composed of Carbon, Hydrogen, and occasionally Nitrogen and Oxygen, and upon the proportions of these are supposed to depend the elasticity or compactness of the substance. Elastic Bitumen is not heavier than water, of a brownish tinge, and possesses a bituminous odour, it burns freely, with much flame and smoke, and with a gentle heat melts into a consistency of Naptha or Petroleum ; it readily takes out the traces of pencil in the manner of Indian Rubber.

Compact Bitumen is of a blackish colour ; one variety which is moderately soft, and capable of receiving an impression from the nail, is known by the name of Maltha ; it is nearly twice the weight of water, and is occasionally used for the same purposes as Pitch, and is applied in some countries to the cure of wounds. When this substance is brittle and hard it is called Asphalt, it gives out a bituminous odour when rubbed, is opaque, of a blackish brown colour, and unctuous to the feel. This variety is used for the manufacture of varnishes, particularly those kinds used by Engravers, it is also mixed with grease, and when gently heated, used for paying the bottoms of ships, and is considered as a protection against the Teredo or Ship-Worm. It is found in France, Switzerland, Asia, and abundantly in the West Indies.

Coal, the basis of the substances known by the term coals, is pure carbon; from which circumstance they rank with Minerals, otherwise from the wood-like appearance observable in every species of Coal, they seem to partake more of a vegetable than a mineral nature. In all the varieties of coal, wood, in a greater or lesser degree bituminized is found, as also seed-vessels and kernels of various kinds, the latter kinds are principally found in countries where the land has been overflowed; the Coal used for domestic purposes, is known to Mineralogists by the name of Slate or Black Coal, it is composed of about sixty parts of Carbon, thirty to thirty-six of Naptha and Asphalt, and from two to eight of oxyde of Iron, and earthy substances. It mostly occurs in horizontal strata, and is very abundant in England, and some other parts of Europe.

Jet or Pitch Coal is a variety possessing a greater degree of hardness than common coal, though very brittle; it is found in masses, as also in the forms of stems and branches of Trees; the coarser sorts are consumed for fuel, and the harder and fine parts are made into beads and trinkets; it is of a full velvety black colour, burns with a greenish flame, much odour, and its residuum is a yellowish ash, its weight is about that of water.

Amber, this Mineral burns with a yellowish flame, much odour and smoke, and leaves a black shining residuum; this, as well as what it yields after distillation, is used for the bases of our finest black varnishes. Amber is found in beds, likewise among sand, clay, and gravel, and is generally esteemed of vegetable origin; when distilled it yields the Succinic Acid.

Mellite or Honeystone, this is a rare Mineral, its substance is softer than Amber, is brittle, transparent, and possesses the double refraction ; burning without any perceptible smoke or flame, and its residuum acquires the colour and consistence of Chalk.

We have now briefly enumerated the bases of the various Mineral productions ; it would far exceed our limits to enumerate the varieties into which they run, or the combinations under which they are found, these will be found described in an easy, intelligent manner in ‘Phillips’s Introduction to Mineralogy.’ Earths are generally infusible, and are those substances which form the exterior surface of the globe, and require no particular care either to procure or preserve in their native state ; merely noting under what circumstances they are found, whether in strata, or confused masses, if they appear to be deposits from rivers or other waters ; what substances occur above or beneath, and any peculiar property they may appear to possess locally. Metals are generally found in hilly or mountainous countries, but rarely in a pure state, the ores should be carefully collected, and each piece wrapped in paper, to prevent attrition, the situation under which the various substances may be procured, should be particularly noticed, as also the uses to which they are applied by the natives of the country, these same particulars should be observed with regard to all rocks, stones, clays, or other earthy or Mineral substances ; it will be of considerable service to the science if persons visiting foreign parts, would take the trouble to collect pieces of such rocks or stones as possess any property or appearance peculiar to themselves, likewise specimens of

those of general occurrence, as by knowing what rocks or stones are common to any place, a pretty correct idea may be formed of the other minerals common to the same place ; pieces of from four to six inches square, will be sufficient for experiments ; these should be broken off, as such have considerable advantage over any that may be found lying on the shore, or on the ground, exposed to the action of the air, sun and weather, besides which the fracture will considerably assist in determining its situation in the system.

Collectors should not confine themselves to the procuring rare or beautiful Minerals, as frequently those of more intrinsic value, as Coal, Iron, Copper, &c., are found of very rough unsightly exterior, but every kind should be procured in as natural a state as possible ; with the various processes they are submitted to, in rendering them applicable to the uses of the Inhabitants of the countries they are found in ; how they are rendered pure, and what methods are pursued in separating the Metals from their Ores, their modes of flattening or of drawing the Metals into wire, as also the proportions used in alloying either for coinage, or in the manufacture of articles for domestic or mechanical purposes ; likewise the various agents that are chemically employed for reducing Mineral substances, should be ascertained. In procuring Metals or Ores, they should each be kept distinct, and care taken that no substance containing Acids of any kind be permitted to come in contact with them.

Mineral substances containing Acids, or Salts, should be packed in jars or bottles closely stopped, as the air will

often decompose them, and they should as carefully be secured from water, which would operate in a similar way ; for the use of the Mineralogist, Messrs. Knight, of Forster-Lane, London, have formed Boxes of instruments necessary to the practical Mineralogist. As no other instruction is necessary in packing the generality of Mineral substances than to avoid friction, the Boxes should be strong, and the joints close, so as to exclude the air, and the interstices between the specimens should be carefully filled with some substance that will effectually prevent attrition. As a branch of Mineralogy, we shall just notice that most countries afford a variety of fossil substances, which are highly interesting, and merit the attention of the Traveller ; in chalky countries numerous fossil remains of organized bodies are constantly occurring, particularly the bones and teeth of Animals, as also the shells of Crabs, Echinæ, &c. &c. ; these should be carefully packed in paper, and kept from the air : some kinds are found in the fissures of Rocks, others compacted in the solid substance of Rocks or Stones, many kinds abound in stiff Clays at great depths beneath the surface of the earth ; some are occasionally found in the beds of Rivers, or in beds that have long been dry ; as likewise among shingle on the sea beach.

In making sketches illustrative of the Geology of any country, the direction in which the veins or strata may run should be particularly observed, as whether they be vertical, oblique, or horizontal, if the strata be entire or broken, their distance from the surface, with the intervening strata, where they can be observed from the base to the summit ; if their station be on the shores of the ocean or inland, if tra-

versed by any river, and whether any lakes are in the vicinity. The practical Mineralogist will not fail ascertaining if the waters in the vicinity of Mineral countries are impregnated with any, and what Mineral, if they are prejudicial or salubrious to the inhabitants; if any springs of warm or hot water occur; the craters of burning or extinguished Volcanoes, will also command his attention, and if any use is made of the lava, the periods at which these places are or have been in a state of combustion; if vegetation is affected by the mineralized waters which may occasionally overflow such districts, and in what way; the various modes practiced to form or procure Nitre, common Salt, Sulphur, &c., will necessarily demand his notice; with the quantities of these and other Minerals or Metals extracted or obtained from any given quantity of the crude material.

Much more might be pointed out in this interesting science, as not only worthy the attention of the Naturalist, but of the greatest importance to the advancement of science, the uses to which the various Mineral substances are applicable, being so numerous, and of such vital importance to the successful application of the Arts and Sciences, that no opportunity should be lost of acquiring a knowledge of every use to which Mineral substances are capable of being applied.

MISCELLANEOUS.

AS this volume may fall into the hands of individuals whose attention or pursuits may differ from those of the Naturalist, we shall point out a few particulars wherein persons of observation may render their researches of general use, and greatly facilitate the acquirement of knowledge in general.

On visiting foreign countries, our attention should be directed to the Moral and Religious state of the inhabitants, their laws, peculiar customs, rites, ceremonies, &c. civil and religious; the nature of their religion, as Christian, Jewish, Pagan, &c.; their establishments for the advancement of learning, or the arts, as also the nature of Hospitals, Prisons,

and other public buildings, the peculiar purport for which those establishments may be formed, and how supported and regulated; if the prisons are merely buildings for the incarceration of criminals, or if they are at the same time used as places of reform, if the prisoners are employed, and in what businesses, and under what regulations; of the different modes of punishment; whether, and for what crimes, the punishment of death is inflicted.

The state of learning also requires particular attention, together with any history or traditional accounts that may be extant of the first introduction of civilization, what ancient Books, either manuscript or printed, are contained in public or private Libraries, particularly if any copies of the Scriptures of very ancient date, with any remarkable differences from the present version. Their gems, seals, or coins should be observed, as these often serve to throw much light on the history of past ages, where these are scarce or valuable, impressions of them can easily be taken without any injury, by the following simple method; take a quantity of the crumb of bread that has been baked at least twelve hours, knead this with the thumb and finger in the palm of the hand, till it is quite soft and acquires the consistency of half melted wax; this will require a considerable time, perhaps an hour or more; the bread thus kneaded will have acquired an opake whiteness, and will readily admit of colouring by mixing a small quantity of Vermillion or any other red pigment, with a little milk or cream, and kneading it with the prepared bread, when this is sufficiently soft, it will admit of the slightest indentation, and may be applied to the gem, seal, or coin, and its impression will be

most perfectly taken off, this may be cut into any size or shape, and suffered to dry for a few days, when it acquires almost a stone-like hardness, and will take an extremely high polish; in drying, the impressions will sometimes crack, to prevent which they should before quite dry, be slightly glazed over with fine Olive oil, or the Oil of Almonds, we have known an impression of a common seal taken off in this way, which has answered the purpose of its original for some years.

The state of the Arts of Painting, Engraving, and Sculpture, should also be ascertained, with the peculiar methods of performing the same; what collections of Paintings, or of Natural Curiosities, either public or private exist, if public, under what regulations, and for what purposes. What Artists of celebrity are now residing at the place, with any biographical memoirs of their great Men, either Statesmen, Philosophers, Artists, or the like; with the causes that have led to any remarkable change either in the Government, Customs, or Manners of the Country. The state of their Military or Naval establishments, as also those for civil purposes, for the receipt of the revenue, &c. the modes of Government, as Regal, Republican, or Ecclesiastical, with the plans of succession to the chief offices of the State; all these points demand the attention of the Man of observation, and the more particularly, as they may contribute to the welfare of his own country.

The Agriculturist will not fail to notice the quantities of arable compared with pasture land, the quantities and kinds of wood cultivated, with their various applications;

the construction of their farming and agricultural implements, with their peculiar modes of use ; the methods practised in laying down land for pasturage, or of breaking up land for arable purposes ; what practices are adopted for the improvement or draining of boggy or wet land, as also for bringing dry arid lands into tillage ; what timber trees are likely to be of service if introduced into this country. What plants are in a state of cultivation, as grain, esculent roots, vegetables, fruits, or for æconomical or domestic purposes, as Hops, Tobacco, Coffee, Sugar, &c., and under what treatment ; what modes are adopted for preserving or curing seed that may have been injured by inclement weather, or bad harvesting ; what plants are resorted to as a succedaneum on the failure of any peculiar crop, or in the case of famine. The construction of the carriages employed for agricultural and other purposes, with models of any improvements on those in use here, with the cost and materials of which they are constructed. What animals are employed either for the purpose of husbandry or domestic conveniences, with their food and peculiar management.

The Mechanist will investigate the state of the Mechanical Arts, as also the nature of the various Machines or Engines he may see, the construction of Steam Engines, Machinery for weaving in its various branches, as also what Machines may be in use for dressing and spinning of Cotton, Flax, Hemp, Silk, &c. What plans are adopted in excavating, either for the purpose of Mining, or for Wells ; what particular tackle is used in descending the shafts of Mines, and how managed ; what methods are adopted in launching vessels, and any peculiarities in their construction ; are

steam vessels in use, and the plans on which they are constructed, and impelled; what expedients are resorted to for the reduction of manual labour.

The Manufacturer will observe the different processes the various subjects used in his peculiar department of knowledge are performed, and in what particulars foreigners excel us, either as regards the quality or quantity of the article manufactured, as also by what means this excellence is obtained. The Dyer, from visiting other countries, will learn the modes of preparing the various colours used in his art, and will have opportunities of ascertaining the excellencies or inferiority of the plans here adopted; and of learning the various means used in increasing the brilliancy or intensity of colour.

These remarks have principally related to civilized countries, of such as have not yet emerged from a state of nature, or as usually termed are in a state of Barbarism, much useful and valuable information may be gained, particularly as relates to dyeing, as we frequently find various articles of ornament or dress, possessing dyes far superior in brilliancy to any we can prepare. The various articles used in preparing dyes should be most carefully ascertained, with the modes of preparation, if animal, vegetable, or mineral, the species must be clearly defined, if vegetable, seeds or plants should be procured and transported.

Substances are in frequent use, in countries that have but little or uncertain intercourse with Europe, for various domestic purposes, as for food, clothing, cordage, matting,

fishing lines, &c., which should not be over-looked, as their introduction may be attended with considerable advantage.

The materials of which their huts or dwellings are constructed, their forms, the various modes of dressing and procuring their food, their attire, arms, canoes, &c. should be observed ; together with their rites and ceremonies, civil, and religious ; their places and forms of worship, burial grounds, idols, charms, &c. deserve notice.

The language as far as can be ascertained, should be written down, and any information relative to the original natives of the country is particularly desirable. It should also be learnt if any Europeans have at any time settled among them, either as Missionaries or otherwise ; if the inhabitants are in the practice of bartering or trading with any neighbouring tribe or nation, and what articles this trade comprises. If and in what manner Surgical operations are performed, and in what manner Medical assistance is afforded in case of sickness, if the country is subject to periodical or epidemic diseases of any kind, and how relieved.

The longitude and latitude of each place should be ascertained, with drafts of the coasts, shoals, mountains, rivers, &c. the general degree of temperature, in what particulars the astronomy of any place may differ from our own. The rise and fall of the tides, the direction of any particular current, and the height of their Mountains should be ascertained, an instrument peculiarly adapted and constructed for this last purpose, is made by Mr. Bate, Poultry, London ; it

is called the Mountain Barometer, and being fitted up in the form of a walking stick, is particularly portable.

The foregoing hints we have thrown together as Miscellaneous information, generally addressed to persons whose pursuits are not directed to the study of Natural History, but which relate to particulars that merit the attention of the Philanthropist, as being likely to conduce to the benefit of society at large ; and though the visiting of Hospitals and Prisons, may be considered by the unthinking part of Modern Tourists, as dull unprofitable employment ; the true patriot and well-wisher to his country, will not be deterred by the censure of this insignificant tribe, from performing one of the most imperious of Christian duties, that of alleviating the bodily or mental maladies of his fellow creatures.

The Traveller should provide himself with a good Telescope and Microscope, a pocket Compass, a case of Mathematical Instruments, drawing pencils and colours, ink in powder, writing and drawing papers, the latter should be packed in tin to prevent their being injured by insects or damp.

The Naturalist will not fail to equip himself with the instruments necessary to the furthering of the particular branch of the science to which his attention may be directed : those requisite for Zoological pursuits are few, and are to be obtained at most Surgeon's Instrument Makers ; Nets and Forceps for catching Insects, Herborizing Boxes, cases

of Mineralogical Implements, and most articles requisite in Experimental Philosophy and Chemistry, may be purchased of Messrs. G. and H. Knight, Forster-Lane, London.

The Botanist may obtain very complete Pocket Botanical Microscopes, of various powers and constructions, as also every article for Astronomical, Optical and Mathematical purposes, of Mr. Bate, Mathematical Instrument Maker, Poultry, London.

Conchologists will gain much insight into the Science, if they would, as before recommended, possess themselves of specimens of the various genera and families of shells, these may be obtained, on very moderate terms, of Mr. Mawe in the Strand, London; as also collections of Minerals, assorted and named; this gentleman, with the laudable motive of advancing the study of Natural History, has just established a Museum of Subjects in the two sciences, Conchology and Mineralogy, at Cheltenham, at which establishment, as well as at his residence, as above, the young Naturalist will gain much useful knowledge, not only of Shells and Minerals, but of most other subjects of Natural Curiosity.

Having now given such general instructions as will enable the Naturalist to pursue his favorite object with a probability of success, we take this opportunity of earnestly pressing upon his attention, that as in every created being the wisdom and benevolence of their Almighty Creator is abundantly evinced, and that the wantonly destroying the lives of Animals not only displays a want of feeling in-

compatible with the Christian character, but totally at variance with that of a good or profound Naturalist.

The character of a good Naturalist necessarily implies that of a good man, one who looks with reverential awe and admiration on the works of the Almighty framer of the universe, who made no one being in vain or without its use, for as Cowper justly says,

An inadvertant step may crush the Snail,
That crawls at even'g in the public path;
Yet, he that has humanity forewarned,
Will step aside, and let the reptile live.
For they are all the meanest things that are,
As free to live and to enjoy that life,
As God was free to form them at the first;
Who in his sovereign wisdom, made them all.

The various subjects composing the three kingdoms of nature, so artfully contrived, so wonderfully propagated, and so providentially supported, seem to have been intended, by their Alwise Creator, for the convenience of man, to whose uses every thing is rendered subservient; he tames the fiercest animals, he pursues and catches the swiftest, whether, like himself, they roam on the surface of the green earth, float in the circumambient air, or glide through the abyss of the ocean.

He encreases the number of vegetables affording foodful substance, and from this kingdom obtains what is necessary and convenient for food, for cloathing, for medicine; and for an endless variety of other purposes.

He descends into the bowels of the earth, and extracts from thence those substances by which he is enabled to reduce to his purposes the other kingdoms of nature ; he contrives to render the hardest substances fluid, to separate the useful metal from the useless dross ; in fine, by the inscrutable wisdom of unerring providence, man is enabled to apply almost every object that surrounds him to his service, that availing himself of the benefits offered, he may be induced 'to look up through nature unto nature's God,' and to pay that homage so justly due to the divine Author of his being ; and, that by using, as not abusing the manifold blessings vouchsafed to him, he may be continually induced to offer adoration and praise to the great first cause 'who in his sovereign wisdom made them all.'

FINIS.



